Curriculum Structure for B. Tech. First Year (All Branches)

(In light of NEP 2020)

(NEP-Version II)

For students admitted in 2023-24 onwards

Implemented year-2024-25

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

Near Kathora Naka, Amravati, Maharashtra

PIN 444604

Curriculum Structure for B. Tech. Science and Humanities Engineering Programme

(In light of NEP 2020)

NCrF Level 6

(NEP_Version II)

For students admitted in 2023-24 onwards

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

Near Kathora Naka, Amravati, Maharashtra
PIN 444604
www.gcoea.ac.in

Structure for B. Tech. Programme in light of NEP 2020

For students admitted in 2023-24 onwards

Key Features of Curriculum

1. Multiple entry and exit option after every year.
2. Provision for Open Electives (OE), Vocational and Skill Enhancement Courses (VSE), Ability Enhancement Courses (AE), Indian Knowledge System (IKS), Value Education Courses (VE), Co-Curricular Courses (CC) in addition to program core courses.
3. Mandatory internship of one semester.
4. Credits for Value education courses, Ability Enhancement Courses, Co-Curricular Curricular Activities.
5. Mandatory Non-Credit Courses.
6. Interdisciplinary and multidisciplinary education through single and double minors and open electives.
7. Skill based courses and multiple exit level.
8. Provision for learning in online mode through Swayam/ NPTEL etc courses
9. Provision for B.Tech. Honours with Research degree through research project.
10. Opportunity for learner to choose courses of their interest in all disciplines.
11. Provision of Skill Based Courses and internship/Field project/mini projects for exit options at each level.
12. Flexibility for all types of learners i.e. Good, Normal and Exit

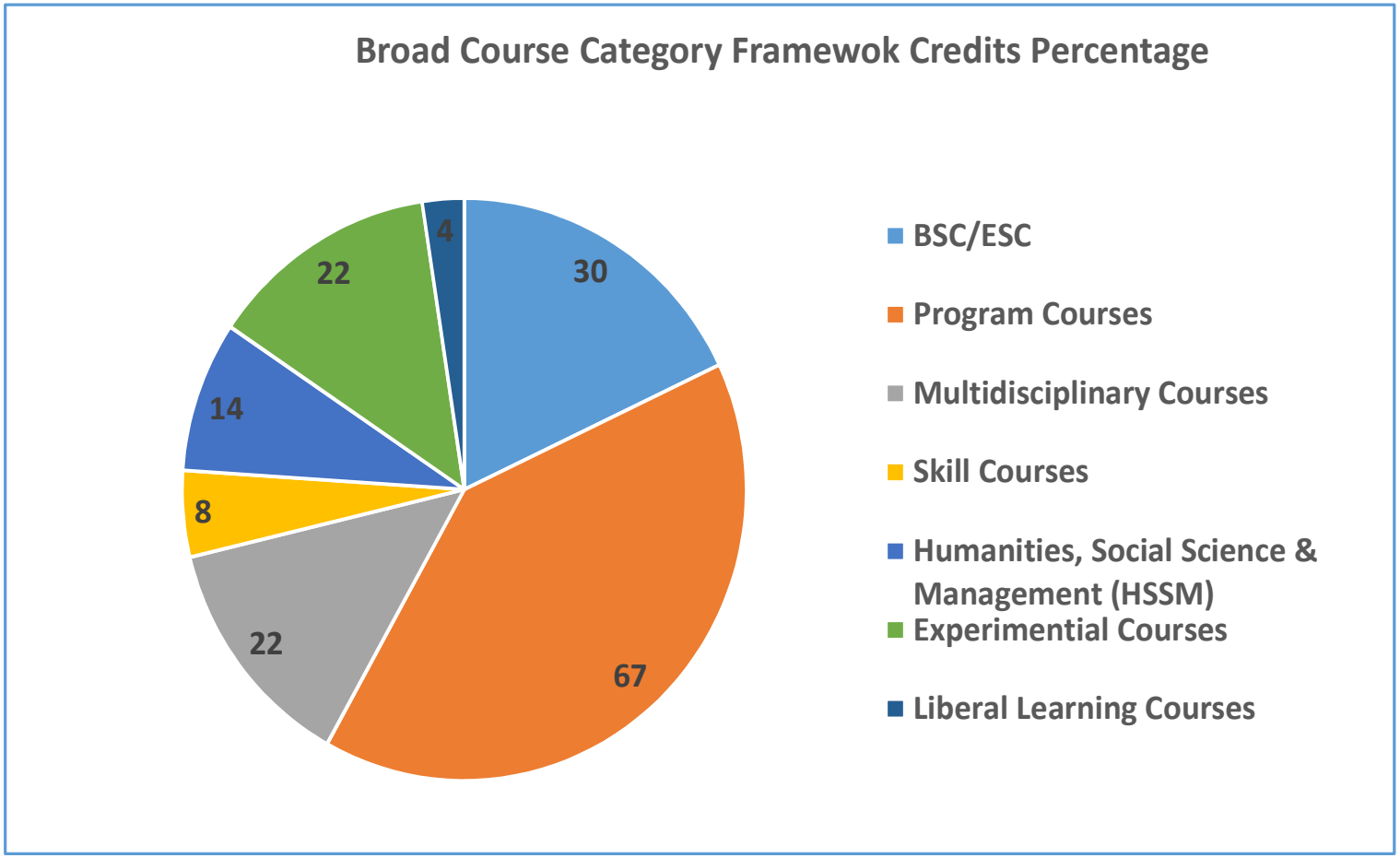
Good Students	Normal Students	Exit
B. Tech. Major with Multidisciplinary Minor	B. Tech. Major with Multidisciplinary Minor	Additional 08 credits in the form of skill-based courses / labs, internship, mini projects shall be offered in 8 weeks.
B. Tech. Honors and Multidisciplinary Minor	--	
B. Tech. Honors with Research and Multidisciplinary Minor	--	
B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	--	

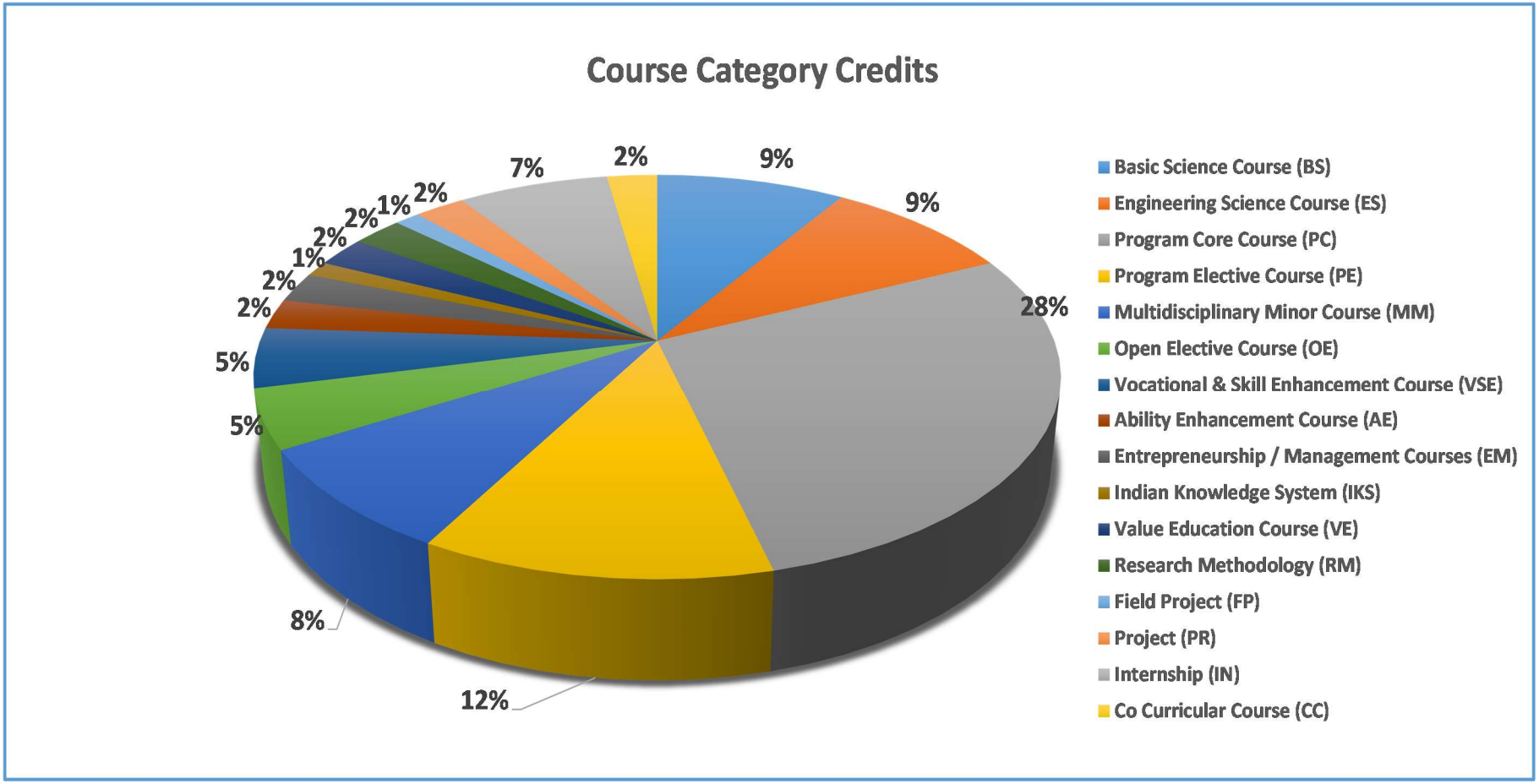
Credit Distribution for each year and Exit Option

NCrFLevel	Year / Semester	Exit Option	Credits	Additional Credits for exit students	Total Credits
4.5	Semester I & II	U. G. Certificate	43	08	51
5.0	Semester III & IV	U. G. Diploma	84	08	92
5.5	Semester V & VI	B. Vocational/B.Sc. Engg.	127	08	135
6.0	Semester VII & VIII	B. Tech.Major with Multidisciplinary Minor	167	--	167
		B. Tech. Honors and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. Honors with Research and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	167+18=185	--	185

Course Category-wise Credit Distribution

Course Category	As per NEP GR	GCOEA Credits	CC	As per NEP GR	GCOEA Credits
BSC/ESC	30	30	BS	14-18	18
			ES	16--12	12
Program Courses	64-76	67	PC	44-56	47
			PE	20	20
Multidisciplinary Courses	22	22	MM	14	14
			OE	8	8
Skill Courses	8	8	VSE	8	8
Humanities, Social Science & Management (HSSM)	14	14	AE	4	4
			EM	4	4
			IKS	2	2
			VE	4	4
Experiential Courses	22	22	RM	4	4
			FP	2	2
			PR	4	4
			IN/OJT	12	12
Liberal Learning Courses	4	4	CC	4	4
Total Credits	**160-176**	**167**		**160-176**	**167**


Broad Course Category Framewok Credits Percentage
30
67
22
8
14
22
4
BSC/ESC
Program Courses
Multidisciplinary Courses
Skill Courses
Humanities, Social Science & Management (HSSM)
Experimental Courses
Liberal Learning Courses



Semester-wise Credit Distribution

Sr. No.	SEM	I	II	III	IV	V	VI	VII	VIII	Total Credits	NEP Requirement
1	Basic Science Course (BS)	8	7	3						18	14-18
2	Engineering Science Course (ES)	8	4							12	12-16
3	Program Core Course (PC)		6	11	12	9	6	3		47	44-56
4	Program Elective Course (PE)					4	8	8		20	20
5	Multidisciplinary Minor Course (MM)			3	3	3	3	2		14	14
6	Open Elective Course (OE)				3	3		2		8	8
7	Vocational & Skill Enhancement Course (VSE)			2	1	2	1	2		8	8
8	Ability Enhancement Course (AE)	1	3							4	4
9	Entrepreneurship / Management Courses (EM)			1					3	4	4
10	Indian Knowledge System (IKS)	2								2	2
11	Value Education Course (VE)	2	2							4	4
12	Research Methodology (RM)								4	4	4
13	Field Project (FP)						2			2	2
14	Project (PR)							4		4	4
15	Internship (IN)								12	12	12
16	Co Curricular Course (CC)				2	2				4	4
	Total Credits	**21**	**22**	**20**	**21**	**23**	**20**	**21**	**19**	**167**	160-176

General Instructions:

(1) 10% content of syllabus of each theory course shall be completed by the students with self-study. The 10% portion of each course (for self-study) shall be declared by the concerned course-coordinator at the beginning of teaching of the course.

(2) Student can complete **any Course** or programme elective courses PE1 to PE5 in "online" mode, offered through SWAYAM/ NPTEL portal or equivalent platform which provides Evaluation mechanism with the permission of Departmental Faculty Board (DFB). In this case –

(i) Students can register and complete these online courses any time after beginning of third semester, however, the student must successfully complete and pass the course, and submit the score card/certificate before declaration of result of respective semester in which the course is being offered.

(ii) In case, if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute in respective semester as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the course, and successfully complete the course.

(3) In eighth semester, the students have to complete mandatory internship of one semester in the company/ organization approved by the DFB.

(4) In eighth semester during internship, the students have to complete the theory courses in any one of the two modes:

(i) **Online courses** offered through SWAYAM/ NPTEL or equivalent platform which provides Evaluation mechanism with the permission of DFB: In this case, students can register and complete these online courses any time after beginning of third semester and complete the course and submit the score card/ certificate before declaration of result of eighth semester.

In case if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the course personally as per the schedule declared by the institute, and successfully complete the course.

(ii) **Self-study mode:** In this case the student will have to study the course offered by the institute of his/her own. The student shall appear for all the college assessments/ examinations (CT1/CT2, TA and ESE) personally as per the schedule declared by the institute and successfully complete the course.

(5) In addition to program specific courses, the students have to complete vocational skill courses, internship, field projects connected to **major degree**.

(6) Exit Option:
The exit option at the end of each year will be available to students after even semester. e. 2nd semester, 4th semester &6th semester and will commence from AY 2024-25 for UG Certificate, AY 2025-26 for UG Diploma, AY 2026-27 for B. Voc./B. Sc. Engineering degree.

(7) Students opting for exit at any level (after odd semesters or even semester) will have to earn additional eight credits before exit in skill based vocational courses and internship/apprenticeship/mini project to make them eligible to get UG certificate / UG Diploma or B. Voc./B. Sc. Engineering degree as per eligibility.

(8) Re Entry and Lateral Entry: Students opting for exit at any level after even semester, will have the option to re-enter the programme from where they left off in odd semesters within **four years of exit.** There shall be a gap of at least **one year** between exit and re-entry to UG programme.

(9) Students opting for exit after odd semester, i.e. 1st, 3rd, 5th or 7th semester will have the option to re-enter the programme from where they left off in even semesters only. There shall be a gap of at least **one year** between exit and re-entry to UG programme.

(10) Maximum period for completion of B. Tech. programme:
The student has to complete the degree programme within the stipulated **maximum period of eight years** from the date of admission to first year UG. The maximum duration of the programme includes the period of exit, withdrawal, absence and different kinds of leaves permissible to a student but it shall exclude the period of rustication of the student from the institute. However, genuine cases on confirmation of valid reasons may be referred to Academic Council for extending this limit by **additional one year**.

(11) Eligibility for admission to the UG Bachelor's Degree with Honours/ Research/Double Minor:
Students with minimum **CGPA of 7.5** without backlog courses at the end of fourth semester and should have earned 84 **credits** are eligible for admission to the UG Bachelor's Degree with Honours/ Research/ Double Minor.

Multiple exits: Following options are available for multiple exists:

Option	NCrF Level	Qualification Title	Additional credit requirement	Bridge courses
Exit-1	4.5	One year UG certificate course in Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at ITI Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project
Exit-2	5.0	Two year UG Diploma I Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at Diploma Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project
Exit-3	5.5	Three year Bachelor Degree in Vocation (B.Voc) orB.Sc. (Engg./Tech)	8	2 Month Internship **OR** Online Two skill courses at Degree Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project

SEMESTER –I														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
		Induction Program	TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
BS1	SH1121	Engineering Mathematics-I	3	1		4	15	15	10	60			100	4
BS2	SH1122	Engineering Physics	3			3	15	15	10	60			100	3
	SH1123	Engineering Physics Laboratory			2	2					25		25	1
ES1	EE1121	Basic Electrical Engineering	3			3	15	15	10	60			100	3
	EE1122	Basic Electrical Engineering Laboratory			2	2					25		25	1
ES2	CS1121	Programming for Problem Solving	2			2	15	15	10	60			100	2
	CS1122	Programming for Problem Solving Laboratory			2	2					25		25	1
ES3	ME1121	Workshop Practices			2	2					25		25	1
AE1	SH1124	Communication Skill			2	2					50		50	1
VE1	SH1125	Environment Science	2			2	15	15	20				50	2
IKS1	SH1126	Indian Knowledge System	2			2			40				40	2
Total			**15**	**1**	**10**	**26**	**75**	**75**	**100**	**240**	**150**		**640**	**21**

SEMESTER –II														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT-1	CT-2	TA	ESE	ICA	ESE		
BS3	SH1221	Engineering Mathematics-II	3	1		4	15	15	10	60			100	4
BS4	SH1222	Engineering Chemistry	2			2	15	15	10	60			100	2
	SH1223	Engineering Chemistry Laboratory			2	2					25		25	1
ES4	ME1221	Engineering Graphics	2			2	15	15	10	60			100	2
	ME1222	Engineering Graphics Laboratory			2	2					25		25	1
PC1	XX1221	Programme (specific Subject -1	3			3	15	15	10	60			100	3
ES5	XX1222	Programme specific Subject -1 Laboratory			2	2					25		25	1
PC2	XX1223	Programme (specific Subject -1	3			3	15	15	10	60			100	3
AE2	SH1224	Modern Indian Language		2		2	15	15	20				50	2
VE2	SH1225	Universal Human Value	2			2	15	15	20				50	2
MNC1	SH1226	Yoga &Fitness			2	2			20				20	0
AE3	SH1227	Language Laboratory			2	2					25		25	1
			15	**3**	**10**	**28**	**105**	**105**	**110**	**300**	**100**		**720**	**22**

Note : In first semester , the students of Civil, Electrical, Electronics & Telecommunication ,Instrumentation Engineering programmes will be offered the courses mentioned under Semester-I **AND** students of Mechanical , Computer Science Engineering and Information Technology will be offered the courses mentioned under Semester-II and in Second Semester Vice-versa except Engineering Mathematics-I (SH1101) and Engineering Mathematics-II (SH1201).

Equivalence Scheme

Programme Name:-B. Tech. First Year

S N.	Course code with Name of course (old)						Course code with Name of course(NEW) (NEP Version-II)		
	Revised Curriculum 2019-20			NEP Version I					
	Code	Name	Credit	Code	Name	Credit	Code	Name	Credit
1	SHU121	Physics		SH1102	Physics	2	SH1122	Engineering Physics	3
2	SHU104	Physics Lab.		SH1104	Physics Lab.	1	SH1123	Engineering Physics Lab.	1
3	SHU221	Chemistry		SH1202	Chemistry	2	SH1222	Engineering Chemistry	2
4	SHU204	Chemistry Lab.		SH1203	Chemistry Lab.	1	SH1224	Engineering Chemistry Lab.	1
5	SHU122	Mathematics - I		SH1101	Mathematics - I	3	SH1121	Mathematics - I	4
6				SH1201	Mathematics -II	3	SH1221	Mathematics -II	4
8				SH1103	Communication Skill	2	SH1124	Communication Skill	2
9				SH1105	Environment Science	2	SH1125	Environment Science	2
11				SH1203	Modern Indian Language	2	SH1224	Modern Indian Language	2
12				SH1205	Universal Human Value	2	SH1225	Universal Human Value	2
13				SH1206	Yoga &Fitness	0	SH1226	Yoga &Fitness	0
14				SH1207	Language Laboratory	1	SH1227	Language Laboratory	1

Course Code	SH1121								Course Category			BS1
Course Name	ENGINEERING MATHEMATICS-I											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE		
03	01	-	04	15	15	10	60	2 hrs 30 min	-	-	100	04

Course Objectives:

To make the students aware

1. To study Fourier series with various expansions
2. To Learn and understand the matrix Algebra to solve Engineering problems
3. To equip students with the foundations of complex numbers mostly used in varied applications in engineering and science.
4. To study special functions for solving different Engineering problems
5. To understand Partial derivatives used to solve engineering problems.

Course Contents:

Fourier series:
Fourier series, Dirichlet's conditions, Change of Interval, Fourier series for discontinuous functions, Fourier series for odd and even functions, Half range Fourier series, Harmonic analysis.

Matrix Algebra:
Rank of Matrix: Echelon and normal form, Consistency for System of linear equations, Linear dependence and independence of vectors, Eigen values and Eigen vectors, Cayley Hamilton theorem (without proof)

Complex number:
Demoivre's theorem, roots of complex number, circular and hyperbolic functions, Separation of real and imaginary parts, Logarithm of Complex number. Expansions of sine, cosine multiple of angle into powers of Sin and cosine of angle

Special functions:
Gamma and beta functions, properties, relation between beta and gamma functions, Differentiation under integral sign.

Partial Differentiation:
Partial derivatives, Euler's theorem on homogeneous function, total derivative, Jacobian and

its properties, Maxima and minima for the function of two variables. Lagrange's method of undetermined multipliers.

Textbooks:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers,2020,44th edition.
2. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, Reprint,2010.
3. A text book of Applied Mathematics, P. N. Wartikar and J. N. Wartikar (Vol I and ll), Pune VidyarthiGrihaPrakashan, Pune, 7'h Edition, 2003

References:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
2. Advanced Engineering Mathematics, H.K.Das, S.Chand& Company Pvt.Ltd,2014.
3. Higher Engineering Mathematics, B.V,Ramana, Tata McGraw Hill Publishing company Ltd.,New Delhi,2008,6th edition.

Course Outcomes:

After successful completion of this course student will be able to

SH1121.1. Use matrix Algebra to solve Engineering problems.
SH1121.2. Obtain Fourier series with various expansions.
SH1121.3. Apply complex numbers mostly used in varied applications in engineering and science.
SH1121.4. Analyze and apply special functions for solving different Engineering problems.
SH1121.5. Apply Partial derivatives applications used to solve engineering problems.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SH1121.1	3	3	3	3	3	0	0	0	0	0	0	0	3	0	0
SH1121.2	3	3	3	3	3	0	0	0	0	0	0	0	3	0	0
SH1121.3	3	3	3	3	3	0	0	0	0	0	0	0	3	0	0
SH1121.4	3	3	3	3	3	0	0	0	0	0	0	0	3	0	0
SH1121.5	3	3	3	3	3	0	0	0	0	0	0	0	3	0	0

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	SH1122								Course Category			BS2
Course Name	ENGINEERING PHYSICS											
Teaching Scheme				Examination Scheme								Credits
				Theory					Practical		Total	
Th	Tu	Pr	Total	CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30 min	-	-	100	03

Course Objectives:

To make the students aware and understand:

1. To provide exposure about the basic principles of Physics along with the possible applications.
2. Understand the depth knowledge of various topics of Physics.
3. To develop an insight that provides a necessary foundation for scientific thinking and innovation.
4. To create awareness about the vital role played by science & recent advancements in technology.
5. To provide a good learning environment for Physics.

Course Contents:

Quantum Physics:

Introduction to quantum mechanics, wave nature of particles, wave function and wave packet, Heisenberg's uncertainty principle (its experimental illustration), application (nonexistence of electron in nucleus), motion of a free particle, time-dependent and time-independent Schrödinger wave equations, solution of stationary-state Schrödinger equation for one dimensional problem–particle in a box.

Semiconductor Physics:

Band theory of solid, Band structure of Si, C and Na, Fermi Energy and F-D distribution, Fermi level in intrinsic and extrinsic semiconductors, semiconductor conductivity, PN-junction, and its working based on energy band diagrams, Hall effect (Hall voltage and coefficient), Solar cell: Introduction, Types (Organic, Plasmonic, Tandem, Thin film, Biohybrid and Dye-Sensitized) characteristic, Application of Solar Cell.

Superconductor: Introduction, types I and II, Meissner effects, Applications of Superconductor in Engineering.

Nanotechnology: Introduction, nanomaterial's, method of synthesis (Physical, Chemical & Green), characterization techniques (UV, SEM XRD) applications of nanomaterial's in Engineering.

Astronomy Astrophysics and Cosmology: Introduction, understanding the Universe, scale of universe, The Altitude Azimuth Coordinate System, Observing the universe, the origin and evaluation of universe.

Text Books:

1. Concept of Physics by Arthur Beiser
2. Engineering Physics by Dr. K. C. Nandi
3.Textbook of Optics, N. Subrahmanyam, Brij Lal, S. Chand, 2006
4. Physics of Solar Cells: From Basic Principles to Advanced Concepts 2016 by Peter Würfel, Uli Würfel
5.Hand Book of Astronomy and Astrophysics By Martine V. Zonmbeck.

Reference Books:

1. Introduction to Astronomy and Cosmology by Ian Morison
2. Engineering Physics, Dattu R. Joshi, Mc Graw Hill Education, 2010.
3. Fundamentals of Physics, D. Halliday, R. Resnick, J. Walker, John Wiley & Sons, 2011
4. Materials Characterization Techniques, Sam Zhang, Lin Li, Ashok Kumar
5. "Astronomy for Beginners" by Jeff Becan
6. Superconducting Materials and Their Applications, Jatinder Vir Yakhmi
7. Introduction to Astronomy and Cosmology by Ian Morison.
8. Fundamentals of Solar Cell Design by Mohd Imran Ahamed, Rajender Boddula, and Mashallah Rezakazemi

Course Outcomes:

At the end of this course, students will demonstrate the ability to
SH1122.1 Understand the concepts in Quantum Physics and will be able to apply them.
SH1122.2 Understand origin of energy bands in solids with focus on semiconductors and solar cell.
SH1122.3 To help them gain knowledge of superconductors and their application.
SH1122.4 Discuss the basics of Nanotechnology their application.
SH1122.5 Discuss the basics of Astronomy and their important.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SH1122.1	3	0	3	0	0	0	0	0	0	2	2	3	2	2	1
SH1122.2	3	2	3	0	2	0	2	0	0	3	2	3	2	2	1
SH1122.3	3	2	3	2	0	0	3	3	0	3	3	3	2	2	1
SH1122.4	3	2	3	2	2	0	2	0	0	3	3	3	2	2	1
SH1122.5	3	2	3	2	2	0	3	1	0	3	3	3	2	2	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	SH1123								Course Category			BS2
Course Name	ENGINEERING PHYSICS LABORATORY											
Teaching Scheme				Examination Scheme								
				Theory					Practical		Total	Credits
Th	Tu	Pr	Total	CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	-	25	01

Course Objectives:

To make the students will be able to:

1. The practical aspect of physics explores the relationships between physical parameters, cultivates the habit of inquiry and acquires skills of observation.
2. Identification of possible errors, analysis, and interpretation of data into results.
3. Introduction to modern scientific and technical tools necessary for professional practice.

Course Contents:

This is a representative list of practicals. The student is required to perform a minimum of eight experiments as per his choice to cover the entire contents of this course.

Representative list of experiments related to the course contents of SH1104 (Physics):

1. Determination of energy gap in semiconductors.
2. Determination of surface resistivity of given semiconductor by four probes method and study its temperature variation.
3. To determine type of semiconductor and Hall coefficient. To determine the carrier concentration and conductivity of a semiconductor using Hall effect.
4. To determine the divergence of LASER beam.
5. Determination of wavelength of LASER beam using diffraction of grating element.
6. To determine the Curie temp and relative permittivity of given ferro-electric material.
7. Study measurement of voltage and frequency using Cathode Ray Oscilloscope.
8. Study of Meissner effect in high TC superconductors and determination of its transition temperature.
9. Study characteristics of solar cells at different intensities and determination of maximum workable power.
10. Study of optical fiber characteristics.
11. UV characterization of metal oxide nanoparticles.
12. UV characterization of green synthesis nanoparticles.
13. Observation of planetary system using telescope.
14. Observation of Galaxies using telescope.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

SH1123.1 Identify probable errors and their rectification.

SH1123.2 Demonstrate skills and competencies to conduct wide range of scientific experiments.

SH1123.3 To learn synthesis, characterization, and application advance materials.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SH1123.1	3	3	2	3	2	3	1	0	0	0	2	3	3	2	1
SH1123.2	3	3	2	3	2	3	1	0	1	0	2	3	3	2	1
SH1123.3	3	3	2	3	2	3	1	0	1	0	2	3	3	2	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

ICA – Internal Continuous Assessment shall be based on the practical record and knowledge/ skills acquired. The performance shall be assessed experiment wise using continuous assessment formats, A and B.

Course Code	SH1124								Course Category			AE1
Course Name	COMMUNICATION SKILL											
Teaching Scheme				Examination Scheme								Credits
				Theory					Practical		Total	
Th	Tu	Pr	Total	CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	50	-	50	01

Course Objectives:

The objectives of offering this course are to-

1. Foster collaborative communication skills: Cultivate teamwork and collaboration by equipping engineering students with the skills to effectively communicate and collaborate.
2. Enhance presentation and public speaking abilities: Equip engineering students with the necessary skills to deliver compelling and engaging presentations, enabling them to effectively communicate their ideas.
3. Develop professional communication skills: Prepare engineering students for professional settings by honing their interpersonal skills.
4. Strengthen cross-cultural communication skills: Enable engineering students to communicate effectively and respectfully across cultural boundaries.

Course Contents:

This is a representative list of practicals. The student is required to perform a minimum of eight experiments as per his choice to cover the entire contents of this course.

Representative list of experiments related to the course contents of SH1103 (Communication Skill):

1. Understanding the importance of communication skills in professional settings.
2. Developing self-awareness and active listening skills.
3. Overcoming communication barriers and fostering empathy.
4 Enhancing clarity and coherence in spoken communication.
5. Using appropriate tone, voice modulation, and body language.
6. Effective questioning and active engagement in conversations.
7. Writing clear and concise emails, memos, and reports
8. Structuring written documents effectively
9. Grammar, punctuation, and proofreading technique
10. Building and maintaining positive relationships.

13.Conflict resolution and negotiation skills.

14. Assertive communication and active listening in interpersonal interactions.

Course Outcomes:

After studying the course, the students will be able to: -

SH1124.1 Develop effective communication and collaboration skills. Students will be able to demonstrate effective teamwork and collaboration by employing various communication strategies and techniques.

SH1124.2 Deliver compelling and engaging presentations. Students will possess the necessary skills to deliver impactful presentations, allowing them to effectively communicate their ideas in a clear and engaging manner.

SH1124.3 Demonstrate professional communication skills. Students will be prepared for Professional settings and possess strong interpersonal skills that enable them to communicate effectively, professionally, and respectfully.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SH1124.1	1	0	2	3	1	2	1	2	1	1	1	3	1	1	1
SH1124.2	1	0	2	3	1	2	1	2	1	1	1	2	1	1	1
SH1124.3	1	0	2	3	1	2	1	2	1	1	1	2	1	1	1

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

ICA – Internal Continuous Assessment shall be based on the practical record and knowledge/ skills acquired. The performance shall be assessed experiment wise using continuous assessment formats, A and B.

Course Code	SH1125								Course Category			VE1
Course Name	ENVIORNMENT SCIENCE											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		To tal	
				CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE		
02	-	-	02	15	15	20	-	-	-	-	50	2

Course Objectives:

The objectives of offering this course are to-

1. Creating the awareness about environmental problems among people
2. Imparting basic knowledge about the environment and its allied problems.
3. Be aware of various environmental factors and their preservation.
4. Teach them how to protect Environment and natural resources.
5. How to make equitable use of energy resources.

Course Contents:

The Multidisciplinary Nature of Environmental Studies:
Definition, scope, and importance, Need for public awareness.

Social issues and Environment:
From Unsustainable to sustainable development, urban problems related to energy, Water conservation, rainwater harvesting, and watershed management Resettlement and rehabilitation of people, problems.

Environmental Ethics:
Issues and possible solution, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Wasteland reclamation. Consumerism and Waste products, Environment protection act, Air (prevention & control) act, Water (prevention and control) act, Wildlife protection act, Forest conservation act, Issues involved in enforcement of environmental legislation.

Human Population and Environment:
Environment and human health, Human rights, Role of Information Technology in Environment and human health, public awareness.

Natural Recourses:
Conventional energy resources: definition, classification, composition, energy content types: coal, petroleum, natural gases, hydro geothermal, nuclear, environmental implication

of energy uses. Non-conventional energy resources: solar energy, wind energy, tidal energy, geothermal energy, hydropower's and biogas.

Ecosystem and Biodiversity:
Concept of ecosystem, Structure and function of ecosystem, Producer, consumer, decomposers. Energy flows in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of following ecosystem: Forest ecosystem, Grass land ecosystem, Desert ecosystem Aquatic ecosystem (Rivers and ocean).
Introduction- definition: genetics, species and ecosystem, diversity.
Biogeographically classification of India. Conservation of biodiversity- In-situ and Ex-situ conservation of Biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts. Endangered and endemic species of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local level. India as mega diversity nation. Hot spot of biodiversity.

Environmental Pollution:
Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste, Management, Causes effects and control measures, Role of individual in prevention of pollution, Hazardous waste management, Biomedical waste management, Disaster management: floods, earthquake, cyclone and landslides.

Text Books:
1. Perspectives in environmental studies, Anubha Kaushik, C. P. Kaushik, New Age international Publisher, 2014.
2. A text book of environmental studies, A. Dhinakaran, B. Sankaran, Himalaya Publishing House.
3. A text book of environmental studies, Dr. D. K. Asthana, Dr. M. Asthana, S. Chand Publication.

Reference Books:
1. The Biodiversity of India, Bharucha Erach ,Marin Publishing Pvt. Ltd., Ahmedabad
2. Hazardous Waste Incineration, Brunner R.C., McGraw Hill Inc.,1989.
3. Marine pollution, Clark R.S., Clanderson Press Oxford (TB)
4. Environmental Chemistry, De A.K. Wiley EsternLmt.
5. Environmental Chemistry, Sharma B.K., 2001 Goel Publ., House, Meerat.
6. Environmental Management, Wagner K.D., 1998, W.B. Saunders Co., Philadelphia, USA
7. Environmental Studies, Benny Joseph, 1st edition, 2005,TataMcgraw-Hill Publ.

Course Outcomes:

After studying the course, the students will be able to: -

SH1125.1 Knowing about importance of public participation in preserving and protecting the environment.

SH1125.2 Protect wild life and promotes biodiversity and ecosystems.

SH1125.3 Convey the Environmental awareness among peoples.

SH1125.4 Apply Conservation of various natural resources and environmental factors.

SH1125.5 Aware about social and environmental issues.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SH1125.1	3	1	3	0	3	2	3	3	2	0	0	2	3	3	2
SH1125.2	2	3	0	0	2	3	3	3	1	1	0	3	3	1	2
SH1125.3	3	3	3	2	3	3	3	2	3	1	0	3	3	2	1
SH1125.4	3	2	3	2	3	3	3	2	2	0	2	3	2	3	2
SH1125.5	2	2	1	1	2	3	3	3	1	1	1	3	3	2	2

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	SH1126								Course Category			IKS1
Course Name		INDIAN KNOLEDGE SYSTEM										
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE		
02	-	-	02	-	-	40	-	-	-	-	40	02

Course Objectives:

The objectives of offering this course are to-

1. The basis of Law, the concept 'Constitution' and the fact that our Constitution is a blend of the positive aspects of other Constitutions.
2. The interpretation of the Preamble and statues.
3. The basis of governance of the nation.
4. The aspects covered under the different important Articles.
5. To gain confidence in our Constitution by knowing it better.

Course Contents:

Introduction to the Indian Knowledge System:

- Overview of the Indian knowledge system and its significance in engineering education.
- Historical background and evolution of Indian knowledge systems.
- Key features and principles of the Indian knowledge system.
- Comparison with other knowledge systems.

Ancient Universities in India:

- Introduction to universities in ancient India.
- Overview of prominent universities, such as Nalanda, Vikramashila, and Takshashila.
- Historical context, establishment, and decline of these universities.
- Importance and influence of ancient universities on education, philosophy, and culture.

Disciplines Studied in Ancient Universities:

- Overview of the diverse disciplines studied in ancient universities.
- Exploration of subjects such as mathematics, astronomy, logic, linguistics, philosophy, and medicine.
- Contributions of Buddhist, Jain, Hindu scholars to these disciplines.
- Influence of Buddhist education on the development of knowledge in ancient India.

Indian Knowledge System and Science:

- Examination of the connection between the Indian knowledge system and scientific thought.
- Overview of ancient Indian contributions to mathematics, astronomy, metallurgy, and other scientific fields.
- Discussion on the transmission of Indian scientific knowledge to other civilizations.
- Exploration of the contemporary relevance of ancient Indian scientific ideas.

Text Books:

1. The Indian Heritage: An Overview of Indian Culture and Civilization" by P.N. Chopra.
2. "Indian Philosophy: A Very Short Introduction" by Sue Hamilton.
3. "Indian Philosophy and the Consequences of Knowledge" by Chakravarthi Ram-Prasad.

Reference Books:

1. "Lost Enlightenment: Central Asia's Golden Age from the Arab Conquest to Tamerlane" by S. Frederick Starr.
2. "Nalanda: Ancient Indian University" by M.M. Rahman.
3. "The Crest of the Peacock: Non-European Roots of Mathematics" by George Gheverghese Joseph.
4. "Indian Philosophy of Language: Studies in Selected Issues" by K. Raghavan Pillai.
5. Buddhist Logic: A Fresh Study of Dharmakirti's Philosophy" by David J. Kalupahana.
6. "Fuzzy Sets and Fuzzy Logic: Theory and Applications" by George J. Klir and Bo Yuan.
7. "India: A History" by John Keay.
8. "The Crest of the Peacock: The Non-European Roots of Mathematics" by George Gheverghese Joseph..
9. "Ethics and the Indian Tradition: From Antiquity to the Present" by Purushottama Bilimoria and Joseph Prabhu.

Course Outcomes:

After studying the course, the students will be able to: -

SH1126.1 Understand and remember the knowledge of basic information about Indian Knowledge System.
SH1126.2 Interpretation of the Preamble
SH1126.3 Apply the knowledge of fundamental rights and fundamental duties.
SH1126.4 Understand the basis of governance of the nation.

SH1126.5 Understand the basis of Law, the concept 'Constitution' and the fact that our Constitution is a blend of the positive aspects of other Constitutions.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SH1126.1	0	2	2	0	0	2	0	3	2	0	0	3	3	0	2
SH1126.2	0	2	2	0	0	2	0	3	2	0	0	3	3	0	2
SH1126.3	0	2	2	0	0	2	0	3	2	0	0	3	3	0	2
SH1126.4	0	2	2	0	0	2	0	3	2	0	0	3	3	0	2
SH1126.5	0	2	2	0	0	2	0	3	2	0	0	3	3	0	2

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	SH1221	Course Category	BS3
Course Name	ENGINEERING MATHEMATICS-II		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE		
03	01	-	04	15	15	10	60	2 hrs. 30 min	-	-	100	04

Course Objectives:

1. To Learn and understand the First order differential equations.
2. To learn higher order linear differential equations.
3. To equip students with Numerical solutions of ordinary differential equations mostly used in varied applications in engineering and science.
4. To study multiple integrals for solving different Engineering problems.
5. To learn and understand Probability.

Course Contents:

Differential equations of the first order:
Linear differential equation, Nonlinear, Exact, non-exact differential equations, orthogonal trajectories, simple Electric circuits,

Linear differential equations with constant coefficients:
Higher order linear differential equation: complementary functions, Rules to find particular integrals, Cauchy's homogeneous equation, Legendre's linear equation, Method of variation of parameters.

Numerical solutions of ordinary differential equations:
Picard's method of approximations, Taylor's series method, Euler's method, Modified Euler's method, Runge- Kutta method of fourth order,

Multiple integrals:
Double integrals: Cartesian and polar coordinates, change of order of integrations, Evaluation of integral by changing to polar coordinates, Triple integration, change to spherical and cylindrical coordinates, Applications of multiple integrals: Area and volume.

Probability:
Definition, Laws of Probability (addition law of probability and multiplication law of probability), conditional probability, Baye's theorem.

Textbooks:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers,2020,44th edition.
2. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2010.
3. A text book of Applied Mathematics, P. N. Wartikar and J. N. Wartikar (Vol I and ll), Pune Vidyarthi Griha Prakashan, Pune, 7'h Edition, 2003

References:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
2. Introduction to Probability Theory,P. G. Hoel, S. C. Port and C. J. Stone, Universal Book Stall, 2003 (Reprint).
3. A First Course in Probability, S. Ross, 6th Ed., Pearson Education India, 2002.
4. Advanced Engineering Mathematics, H.K.Das, S.Chand & Company Pvt.Ltd,2014.
5. Higher Engineering Mathematics, B.V,Ramana, Tata Mc Graw Hill Publishing company Ltd., New Delhi,2008,6th edition.

Course Outcomes:

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

SH1221.1. Solve the First order differential equations
SH1221.2. Solve higher order linear differential equations
SH1221.3. Apply Numerical solutions of ordinary differential equations mostly used in varied applications in engineering and science.
SH1221.4. Analyze and apply multiple integrals techniques for solving different Engineering problems
SH1221.5. Solve problems related with Probabilistic models

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SH1102.1	3	3	3	3	3	-	-	-	-	-	-	-	2	-	-
SH1102.2	3	3	3	3	3	-	-	-	-	-	-	-	2	-	-
SH1102.3	3	3	3	3	3	-	-	-	-	-	-	-	2	-	-
SH1102.4	3	3	3	3	3	-		-	-	-	-	-	2	-	-
SH1102.5	3	3	3	3	3	-	-	-	-	-	-	-	2	-	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Member Secretary BoS Chairperson Dean (Academics) Principal

Course Code	SH1222	Course Category	BS4
Course Name	ENGINEERING CHEMISTRY		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE		
02	-	-	02	15	15	10	60	2 hrs 30min	-	-	100	02

Course Objectives:

1. Have knowledge of engineering materials e.g., Refractories, Composite etc.
2. Be aware of Spectroscopic Techniques and Applications.
3 Identify and apply the principles of green chemistry in improving the existing technology.

Course Contents:

Water treatment:
Definition of hardness of water, Types of hardness and softening methods like Lime-Soda, Zeolite and Ion exchange. Units of hardness, Numerical problems on Lime-soda and Zeolite process. Boiler troubles: Boiler corrosion, Priming and Foaming, Scale and Sludge formation and internal treatment for Boiler feed water.

Engineering Chemistry:
Corrosion of metals- definition, types and mechanism of Dry and wet corrosion. Design and Material selection, hot dipping: - galvanizing and tinning. Composite Material- definition, classification and applications. Refractories: types, properties, requisites of good refractory.

Fuel:
Classification, Calorific value-gross & net Determination of calorific value by Bomb calorimeter & Boy's calorimeter, Proximate & Ultimate Analysis of coal & its significance, Cracking of petroleum fractions, use of gasoline & diesel in internal combustion engines. Working of IC engine, Knocking, Antiknocking agents, there properties with chemical constitution, Octane number and Cetane number.

Green Chemistry:
Overview, Set of Principles of Green chemistry, Importance and application of Green Synthesis.

Lubricants:
Introduction, Classification and functions of lubricants, solid lubricants, Mechanisms of Lubrications, Properties of Lubricating oil and Greases, Selection of lubricants.

Engineering Materials:
High Temperature doped Polymers, Conduction Polymers, Foamed Plastics, Organic Electronic Materials, Explosives: introduction, classification, characteristics, disarmanment, Weapon of Mass Destruction (WMD), Peaceful uses of explosives, Fuel Cell and Batteries.

Textbooks:
1. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane.
2. Fundamentals of Molecular Spectroscopy, by C. N. Banwell

Reference Books:
1. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
2. Physical Chemistry, by P. W. Atkins
3. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore.

Course outcomes: After studying the course, the students will be able to:
SH1222.1 Understand the types of hardness of water and softening methods.
SH1222.2 Illustrates the basic fundamental and define their application in various fields of engineering.
SH1222.3 Understand the Determination of calorific value.
SH1222.4 Identify and apply the principles of green chemistry in improving the existing technology.
SH1222.5 Select the appropriate experimental method of analysis and interpret its result.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SH1222.1	2	0	0	1	0	0	0	1	2	0	0	0	2	1	1
SH1222.2	2	0	0	1	0	0	0	1	2	0	0	0	2	1	1
SH1222.3	2	0	0	1	0	0	0	1	2	0	0	0	2	1	1
SH1222.4	2	0	0	1	0	0	0	1	2	0	0	0	2	1	1
SH1222.5	2	0	0	1	0	0	0	1	2	0	0	0	2	1	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	SH1223	Course Category	BS4
Course Name	ENGINEERING CHEMISTRY LABORATORY		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	---	25	-	25	01

Course Objectives:

To make the students will be able to:

1. The practical aspect of chemistry explores the relationships between chemical parameters, cultivates the habit of inquiry and acquires skills of observation.
2. Identification of possible errors, analysis and interpretation of data into results.
3. Introduction to modern scientific and technical tools necessary for professional practice.

The following is the representative list of experiments. A minimum of eight experiments are to be performed.

List of experiments:

1. Determination of surface tension and viscosity of fuel.
2. Determination of hardness of water.
3. Determination of Ca. and Mg. ion by using EDTA method.
4. Determination of chloride content of water.
5. Determination of cell constant and conductance of solution.
6. Synthesis of a polymer/drug.
7. Saponification/acid value of an oil.
8. Determination of flash point of oil.
9. Determination of the partition coefficient of a substance between two immiscible Liquids.
10. Absorption of acetic acid by charcoal.
11. Preparation of cum-methyl salicylate.
12. Green synthesis of organic compound.
13. Preparation of Soap by organic compounds.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

SH1223.1 Identify basic parameters and their rectification.

SH1223.2 Demonstrate skills and competencies to conduct wide range of scientific Experiments.

SH1223.3 To learn analysis of materials.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SH1223.1	2	0	0	0	0	0	0	1	2	0	0	0	2	1	1
SH1223.2	2	0	0	0	0	0	0	1	2	0	0	0	2	1	1
SH1223.3	2	0	0	0	0	0	0	1	2	0	0	0	2	1	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

ICA – Internal Continuous Assessment shall be based on the practical record and knowledge/ skills acquired. The performance shall be assessed experiment wise using continuous assessment formats, A and B.

Course Code	SH1224							Course Category		AE2
Course Name	MODERN INDIAN LANGUAGE									
Teaching Scheme				Examination Scheme						Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE		
-	02	-	02	15	15	20	-	--	-	-	50	02

Course Objectives:

1. To developed skill and competence in modern Indian language
2. How the developments in languages accompanied new polarizations which were occurring in the Indian society.
3. The ways in which the developments in languages were affected by the coming of the Western influence.
4. Consequences the developments in the modern lndian language had on modern Indian history.
5. To develop social and culture aspect.

Course Contents:

Introduction to Marathi Language:

- Overview of the Marathi language, its history, and its regional significance.
- Introduction to the script and phonetics of Marathi.
- Basic vocabulary, grammar, and sentence structure.
- Greetings and conversational phrases in Marathi.

Language Proficiency and Communication Skills:

- Building vocabulary and improving language proficiency in Marathi.
- Practice in speaking, listening, reading, and writing skills.
- Conversation practice and language exercises.
- Enhancing comprehension through audio and visual resources.
- Introduction to commonly used idioms, proverbs, and expressions in Marathi.

Literary Traditions and Texts:

- Study of prominent Marathi authors, poets, and literary figures.
- Analysis of significant literary works and genres (poetry, novels, short stories, plays).
- Understanding the themes, motifs, and cultural contexts in Marathi literature.
- Exploration of regional literary movements and their impact on the language.
- Appreciation of the cultural and historical significance of Marathi literature.

Cultural and Social Contexts:

- Exploration of the cultural and social contexts of Marathi speaking communities.
- Understanding regional customs, traditions, and festivals.
- Examination of cultural and social issues depicted in Marathi literature.
- Study of important historical events and their impact on the language and culture.

- Comparisons between Marathi and other Indian languages and their unique characteristics.

Translation and Interpretation:

- Techniques and principles of translation between English and Marathi.
- Practice in translating texts from different genres (literary, technical, journalistic)
- Interpretation skills for oral communication and cross-cultural understanding.
- Introduction to professional translation and interpretation services.
- Ethical considerations in translation and interpretation work specific to Marathi.

Textbooks:

१. मराठी भाषेचे मूळ – विश्वनाथ खैरे

२. मराठी भाषेचा इतिहास – गं. ना. जोगळेकर

३. मराठी भाषा उगम विकास – कृ. प. कुळकर्णी

३. नेमाडे, भालचंद्र : साहित्याची भार्ा, साकेत प्रकाशन, औरंगाबाद, १९८९.

References:

१. मराठी व्याकरण – मो. रा. वाळवे

२ जेव्हा मी जात चोरली – बाबुराव बागुल

३ बटाट्याची चाळ – पु. ल. देशपांडे

४. ढग – उद्धव शेळके

५. सबनीस म. पा : मराठी भार्ेचे उच्चतर व्याकरण.

६. बनगरवाडी – व. माडगुळकर

Course Outcomes:

After successful completion of this course student will be able to

SH1224.1. Understand the knowledge of basic information about Marathi.
SH1224.2. Understand the language Proficiency and Communication Skills
SH1224.3. Understand Literary traditional and text work done.
SH1224.4. Understand and remember the knowledge of regional literary movements.
SH1224.5. Develop the ability as a translator.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SH1224.1	3	1	0	1	0	0	0	0	0	1	0	2	0	2	2
SH1224.2	3	0	0	0	0	0	0	0	0	1	0	2	0	1	2
SH1224.3	3	0	0	1	0	0	0	0	0	1	0	2	0	1	1
SH1224.4	3	0	0	1	0	0	0	0	0	1	0	2	0	1	2
SH1224.5	3	1	0	1	0	0	0	0	0	1	0	0	0	1	2

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	SH1225	Course Category	VE2
Course Name	UNIVERSAL HUMAN VALUE		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE		
02	-	-	02	15	15	20	-	-	-	-	50	02

Course Objectives:

Students will able to:

1. Distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession.
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life.

Course Contents:

Introduction to Value Education:
Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations

Understanding Harmony in the Human Being:

The understanding human being as a co-existence of the sentient 'T' and the material 'Body, Understanding the needs of Self ('T') and 'Body' – Sukh and Suvidha, Understanding the Body as an instrument of 'T' (I being the doer, seer, and enjoyer), Understanding the characteristics and activities of 'T' and harmony in T, Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam & Swasthya.

Understanding Harmony in the Family & Society:
Understanding harmony in the Family- the basic unit of human interaction, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay tripti; Trust (Vishwas) and Respect (Samman) as the foundational vales of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship., Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi,

Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society, Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha) – from family to world

Understanding Harmony in the Nature & Existence:
Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature – recyclability and self-regulation in nature, Understanding Existence as Co existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

Understanding of Harmony on Professional Ethics Competence in professional ethics:
a) Ability to utilize the professional competence for augmenting universal human order
b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
c) Ability to identify and develop appropriate technologies and management patterns for above production systems.
Case studies of typical holistic technologies, management models and production systems
Strategy for transition from the present state to Universal Human Order:
a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
b) At the level of society: as mutually enriching institutions and organizations

Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

Reference Books and Websites:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers.
8. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Course Outcomes:

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

SH1225.1 Understand the significance of value inputs in a classroom and start applying them in their life and profession
SH1225.2 Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
SH1225.3 Understand the value of harmonious relationship based on trust and respect in their life and profession
SH1225.4 Understand the role of a human being in ensuring harmony in society and nature.
SH1225.5 Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SH1225.1	0	0	0	0	0	2	0	2	2	0	0	0	1	0	2
SH1225.2	0	0	0	0	0	0	0	2	0	0	1	0	2	0	1
SH1225.3	0	0	0	0	1	3	0	2	0	0	0	1	2	0	0
SH1225.4	0	0	0	0	0	2	3	2	0	0	1	1	1	0	3
SH1225.5	0	0	0	0	0	1	2	3	2	0	2	2	1	0	2

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	SH1226	Course Category	MNC1
Course Name	YOGA AND FITNESS		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT-1	Ct-2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	20	-	--	-	-	20	00

Course Objectives:

1. To impart the students with basic concepts of Yoga for health and wellness.
2. To familiarize the students with health-related Exercise, Yoga for Overall growth & development
3. To create a foundation for the professionals in Yoga.
4. To impart the basic knowledge and skills to teach Yoga activities.
5. To develop yoga professionals at various levels of education.

Course Contents:

Introduction:

Meaning and definition of Yoga. Aims, Objectives and Importance of Yoga. History of Yoga. Modern trend of Yoga Brief concept of Yoga.

Yoga & Fitness Training:

Importance of Yoga & Fitness. Fundamentals Principles of Yoga & Fitness Training. Components of Fitness and Fitness Equipment's. Types of Yoga Practices - Asanas, Pranayama and Meditation. Introduction to Balanced Diet for Fitness.

Career Opportunities in Yoga and Fitness:

Yoga professionals at various levels of educational institutions. Yoga Instructors, Coach, Managers, Researcher, Event Organizers, Technical Officials, Entrepreneurs and others. Yoga Trainer for Police and Paramilitary forces at State and Central organizations and others. Health Clubs and Fitness Centers, Aerobics, Dance & Recreation Clubs in Corporate

Sectors, and others. Sports Journalists, Commentators, Photo and Video Analyst, Sports Marketing and Equipment/Props manufactures.

Textbooks:
1. Textbook of Yoga, Yogeshwar

References:
1. The Yoga Meditation, Swami Krishnananda.
2. A Handbook of Basic Asanas, IIITDM Kancheepuram.
3. Yoga & Meditation for Health and Well-Being, William & Mary.
4. Yoga as Therapy, Christopher M Norris.
5. How to Meditate: A Primer for Beginners (Article) Joel M. Evans.
6. Meditation: Techniques and Benefits (Article) Dr. Abdul Wahab Pathath.
7. link: 20+ Yoga Books for Free! [PDF] | InfoBooks.org

Course Outcomes:
After successful completion of this course student will be able to

SH1226.1. Students will be able to understand the basic principles and practices Yoga

SH1226.2. Students will be able to instruct Yoga practices for Healthy Living.

SH1226.3. To develop professionalism among students to conduct, organize & officiate Yoga events at schools and community level.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SH1226.1	1	0	0	0	0	1	2	2	3	0	0	0	1	0	2
SH1226.2	1	0	0	0	0	1	2	2	3	0	0	0	1	0	2
SH1226.3	1	0	0	0	0	1	2	2	3	0	0	0	1	0	2

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	SH1227	Course Category	AE3
Course Name	LANGUAGE LABORATORY		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	---	25	-	25	01

Course Objectives:

To make the students will be able to:

1. Understand and apply communication theory
2. Critically think about communication processes and messages
3. Write effectively for a variety of contexts and audiences
4. Interact skilfully and ethically

Experiment List:

Representative list of experiments related to the course contents. A minimum of eight experiments are to be performed.

1. Comprehension for analysing documents, cultural, emotional intelligence
2. Grammar with Parts of Speech, Figure of Speech, Direct & Indirect Speech, and Models
3. General Vocabulary for Idioms, Phrases, Prefix and Suffix
4. Group Discussion & Interview techniques effectively
5. Soft Skills & Writing Skills with Personality Development Skills, Presentation Skills, Pronunciation, Business Email writing, Reading & Writing Technical Papers, Resume writing
6. Communication Skills & Barriers of communication techniques
7. Pronunciation Exercise – Basic like Pronunciation Practice Listen & Repeat practice for Global Accent
8. Phonetics to Learn Phonetics Lip Movements, Lip Movements with Phonetics for Diphthongs
9. Words frequently confused, avoiding slangs, Avoiding inappropriate use of words in official/educational purposes, difference between words, Grammar Words

Course Outcomes:

At the end of this course, students will demonstrate the ability to

SH1227. 1. Develop Intelligible Pronunciation & Writing Skills

SH1227. 2. Apply Verbal and Non-Verbal Communication Techniques in Professional Environment

SH1227. 3 Handling the group discussion & interview process confidently

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
SH1227.1	2	3	0	0	0	0	0	1	2	0	0	0	3	1	2
SH1227.2	2	0	0	0	0	0	0	1	2	0	0	0	2	1	1
SH1227.3	2	2	0	0	0	0	0	1	2	0	0	0	2	1	1

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

ICA –Internal Continuous Assessment shall be based on the practical record and knowledge/skills acquired. The performance shall be assessed experiment wise using continuous assessment formats, A and B.

Curriculum Structure for
B. Tech. Electrical Engineering Programme

(In light of NEP 2020)

NCrF Level 6

(NEP_Version II)

For students admitted in 2023-24 onwards

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

Near Kathora Naka, Amravati, Maharashtra
PIN 444604
www.gcoea.ac.in

Sign	Sign	Sign	Sign
Member Secretary	BoS Chairperson	Dean, Academics	Principal

Structure for B. Tech. Programme in light of NEP 2020

For students admitted in 2023-24 onwards

Key Features of Curriculum

1. Multiple entry and exit option after every year.
2. Provision for Open Electives (OE), Vocational and Skill Enhancement Courses (VSE), Ability Enhancement Courses (AE), Indian Knowledge System (IKS), Value Education Courses (VE), Co-Curricular Courses (CC) in addition to program core courses.
3. Mandatory internship of one semester.
4. Credits for Value education courses, Ability Enhancement Courses, Co-Curricular Curricular Activities.
5. Mandatory Non-Credit Courses.
6. Interdisciplinary and multidisciplinary education through single and double minors and open electives.
7. Skill based courses and multiple exit level.
8. Provision for learning in online mode through Swayam / NPTEL etc. courses.
9. Provision for B.Tech. Honours with Research degree through research project.
10. Opportunity for learner to choose courses of their interest in all disciplines.
11. Provision of Skill Based Courses and internship/Field project/mini projects for exit options at each level.
12. Flexibility for all types of learners i.e. Good, Normal and Exit.

Good Students	Normal Students	Exit
B. Tech. Major with Multidisciplinary Minor	B. Tech. Major with Multidisciplinary Minor	Additional 08 credits in the form of skill-based courses / labs, internship, mini projects shall be offered in 8 weeks.
B. Tech. Honors and Multidisciplinary Minor	--	
B. Tech. Honors with Research and Multidisciplinary Minor	--	
B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	--	

Credit Distribution for each year and Exit Option

NCrF Level	Year / Semester	Exit Option	Credits	Additional Credits for exit students	Total Credits
4.5	Semester I & II	U. G. Certificate	43	08	51
5.0	Semester III & IV	U. G. Diploma	83	08	91
5.5	Semester V & VI	B. Vocational/B.Sc. Engg.	128	08	136
6.0	Semester VII & VIII	B. Tech. Major with Multidisciplinary Minor	167	--	167
		B. Tech. Honors and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. Honors with Research and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	167+18=185	--	185

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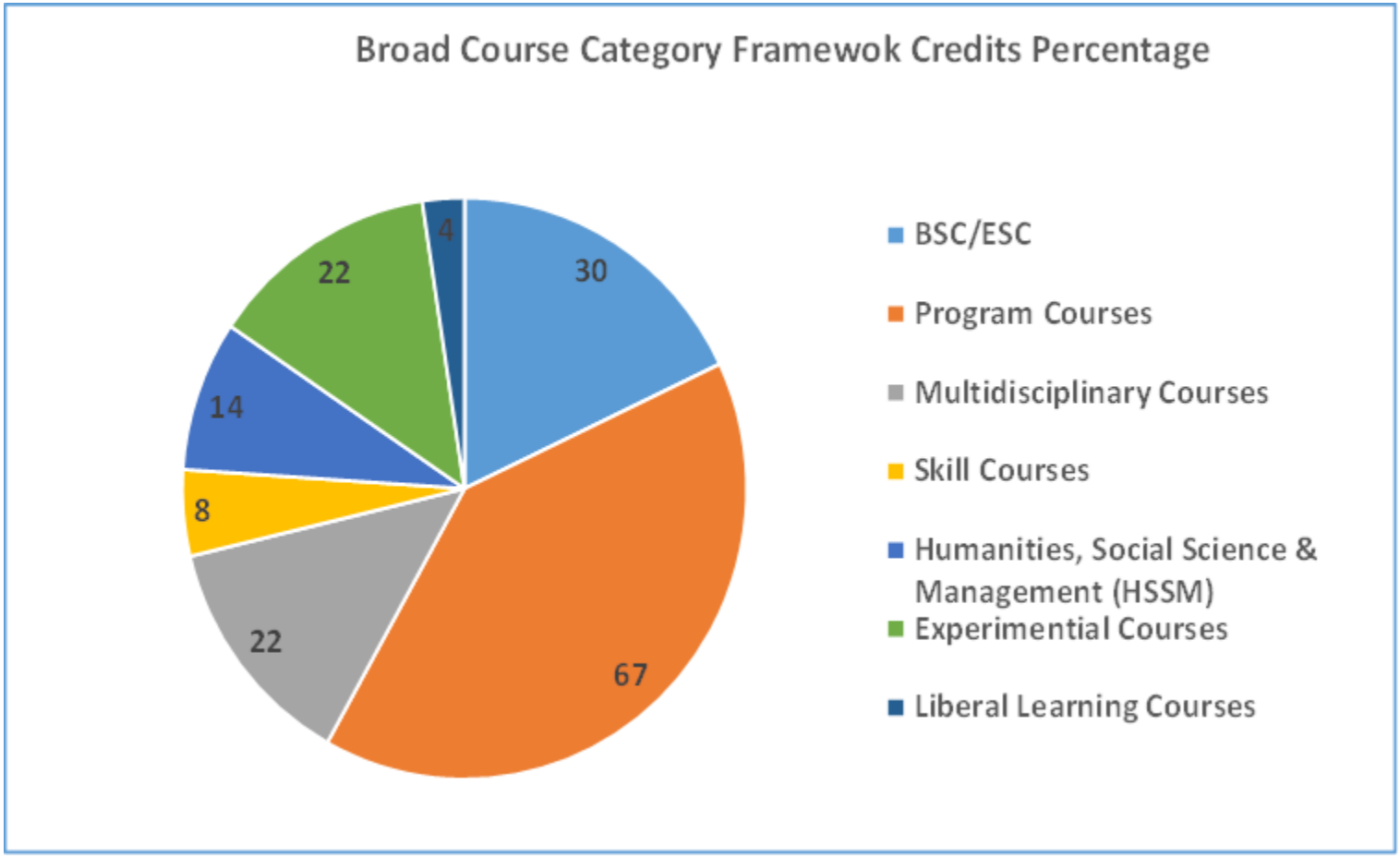
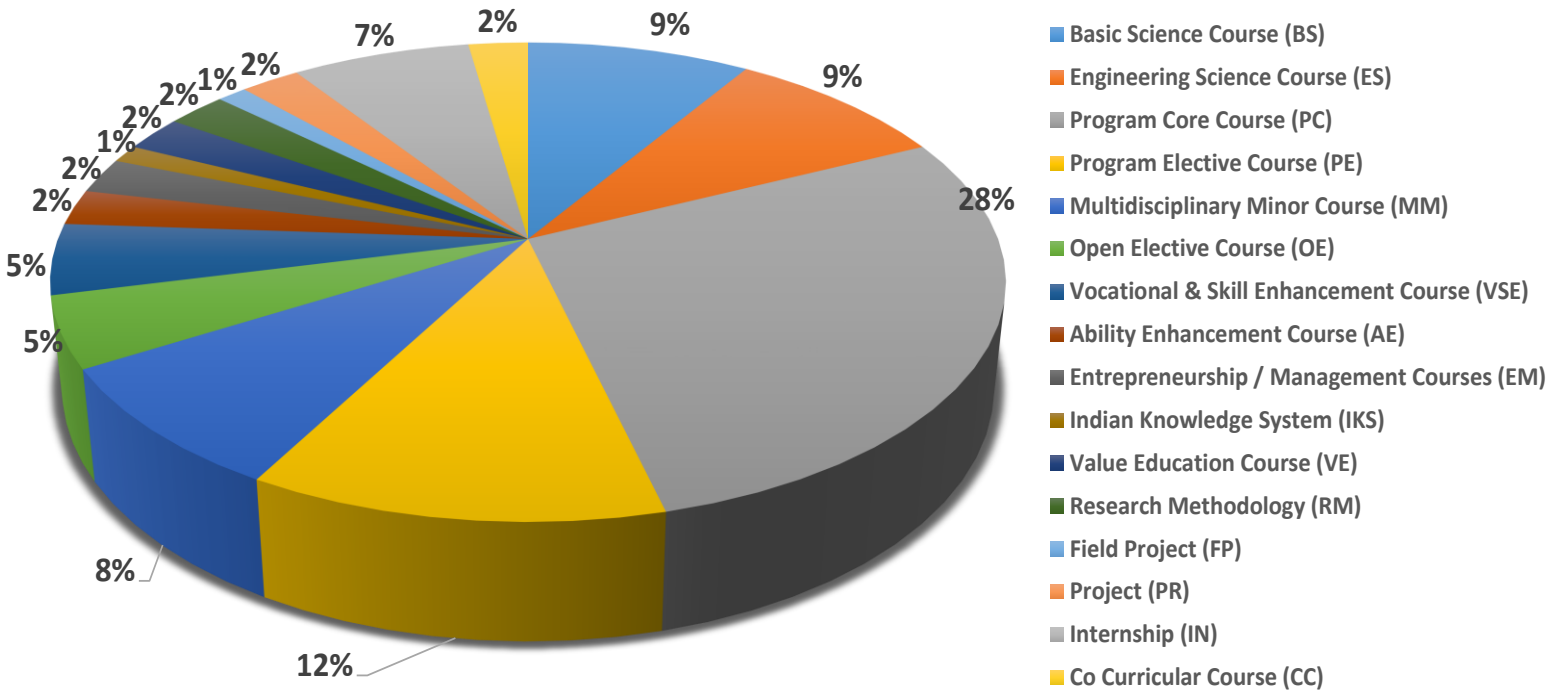
Course Category-wise Credit Distribution

Course Category	As per NEP GR	GCOEA Credits	CC	As per NEP GR	GCOEA Credits
BSC/ESC	30	30	BS	14-18	18
			ES	16-12	12
Program Courses	64-76	67	PC	44-56	47
			PE	20	20
Multidisciplinary Courses	22	22	MM	14	14
			OE	8	8
Skill Courses	8	8	VSE	8	8
Humanities, Social Science & Management (HSSM)	14	14	AE	4	4
			EM	4	4
			IKS	2	2
			VE	4	4
Experiential Courses	22	22	RM	4	4
			FP	2	2
			PR	4	4
			IN/OJT	12	12
Liberal Learning Courses	4	4	CC	4	4
Total Credits	**160-176**	**167**		**160-176**	**167**


Broad Course Category Framewok Credits Percentage
30
67
22
8
14
22
4
BSC/ESC
Program Courses
Multidisciplinary Courses
Skill Courses
Humanities, Social Science & Management (HSSM)
Experimental Courses
Liberal Learning Courses


Course Category Credits
9%
9%
28%
12%
8%
5%
5%
2%
2%
1%
2%
2%
2%
7%
2%
Basic Science Course (BS)
Engineering Science Course (ES)
Program Core Course (PC)
Program Elective Course (PE)
Multidisciplinary Minor Course (MM)
Open Elective Course (OE)
Vocational & Skill Enhancement Course (VSE)
Ability Enhancement Course (AE)
Entrepreneurship / Management Courses (EM)
Indian Knowledge System (IKS)
Value Education Course (VE)
Research Methodology (RM)
Field Project (FP)
Project (PR)
Internship (IN)
Co Curricular Course (CC)

Semester-wise Credit Distribution

Sr. No.	SEM	I	II	III	IV	V	VI	VII	VIII	Total Credits	NEP Requirement
1	Basic Science Course (BS)	8	7	3						18	14-18
2	Engineering Science Course (ES)	8	4							12	12-16
3	Program Core Course (PC)		6	13	11	11	6	3		47	44-56
4	Program Elective Course (PE)					4	8	8		20	20
5	Multidisciplinary Minor Course (MM)			3	3	3	3	2		14	14
6	Open Elective Course (OE)				3	3		2		8	8
7	Vocational & Skill Enhancement Course (VSE)			3	1	2	1	1		8	8
8	Ability Enhancement Course (AE)	1	3							4	4
9	Entrepreneurship / Management Courses (EM)			1					3	4	4
10	Indian Knowledge System (IKS)	2								2	2
11	Value Education Course (VE)	2	2							4	4
12	Research Methodology (RM)								4	4	4
13	Field Project (FP)						2			2	2
14	Project (PR)							4		4	4
15	Internship (IN)								12	12	12
16	Co-Curricular Course (CC)				2	2				4	4
	Total Credits	**21**	**22**	**20**	**20**	**25**	**20**	**20**	**19**	**167**	160-176

General Instructions:

(1) 10% content of syllabus of each theory course shall be completed by the students with self-study. The 10% portion of each course (for self-study) shall be declared by the concerned course-coordinator at the beginning of teaching of the course.

(2) Student can complete **any Course** or programme elective courses PE1 to PE5 in "online" mode, offered through SWAYAM/ NPTEL portal or equivalent platform which provides Evaluation mechanism with the permission of Departmental Faculty Board (DFB). In this case –

(i) Students can register and complete these online courses any time after beginning of third semester, however, the student must successfully complete and pass the course, and submit the score card/certificate before declaration of result of respective semester in which the course is being offered.

(ii) In case, if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute in respective semester as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc.) of the course, and successfully complete the course.

(3) In Eighth semester, the students have to complete mandatory internship of one semester in the company/ organization approved by the DFB.

(4) In eighth semester during internship, the students have to complete the theory courses in any one of the two modes:

(i) **Online courses** offered through SWAYAM/ NPTEL or equivalent platform which provides Evaluation mechanism with the permission of DFB: In this case, students can register and complete these online courses any time after beginning of third semester and complete the course and submit the score card/ certificate before declaration of result of eighth semester.

In case if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc.) of the course personally as per the schedule declared by the institute, and successfully complete the course.

(ii) **Self-study mode:** In this case the student will have to study the course offered by the institute of his/her own. The student shall appear for all the college assessments/ examinations (CT1/CT2, TA and ESE) personally as per the schedule declared by the institute and successfully complete the course.

(5) In addition to program specific courses, the students have to complete vocational skill courses, internship, field projects connected to **major degree**.

(6) Exit Option:

The exit option at the end of each year will be available to students after even semester. i.e. 2nd semester, 4th semester & 6th semester and will commence from AY 2024-25 for UG Certificate, AY 2025-26 for UG Diploma, AY 2026-27 for B. Voc./B. Sc. Engineering degree.

(7) Students opting for exit at any level (after odd semesters or even semester) will have to earn additional eight credits before exit in skill based vocational courses and internship/apprenticeship/mini project to make them eligible to get UG certificate / UG Diploma or B. Voc. /B. Sc. Engineering degree as per eligibility.

(8) Re Entry and Lateral Entry: Students opting for exit at any level after even semester will have the option to re-enter the programme from where they left off in odd semesters within **four years of exit.** There shall be a gap of at least **one year** between exit and re-entry to UG programme.

(9) Students opting for exit after odd semester, i.e. 1st, 3rd, 5th or 7th semester will have the option to re-enter the programme from where they left off in even semesters only. There shall be a gap of at least **one year** between exit and re-entry to UG programme.

(10) Maximum period for completion of B. Tech. programme:

The student has to complete the degree programme within the stipulated **maximum period of eight years** from the date of admission to first year UG. The maximum duration of the programme includes the period of exit, withdrawal, absence and different kinds of leaves permissible to a student but it shall exclude the period of rustication of the student from the institute. However, genuine cases on confirmation of valid reasons may be referred to Academic Council for extending this limit by **additional one year**.

(11) Eligibility for admission to the UG Bachelor's Degree with Honours/ Research/ Double Minor:

Students with minimum **CGPA of 7.5** without backlog courses at the end of fourth semester and should have earned 84**credits** are eligible for admission to the UG Bachelor's Degree with Honours/ Research/ Double Minor.

SEMESTER –I														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
		Induction Program	TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
BS1	SH1121	Engineering Mathematics-I	3	1		4	15	15	10	60			100	4
BS2	SH1122	Engineering Physics	3			3	15	15	10	60			100	3
	SH1123	Engineering Physics Laboratory			2	2					25		25	1
ES1	EE1121	Basic Electrical Engineering	3			3	15	15	10	60			100	3
	EE1122	Basic Electrical Engineering Laboratory			2	2					25		25	1
ES2	CS1121	Programming for Problem Solving	2			2	15	15	10	60			100	2
	CS1122	Programming for Problem Solving Laboratory			2	2					25		25	1
ES3	ME1121	Workshop Practices			2	2					25		25	1
AE1	SH1124	Communication Skill			2	2					50		50	1
VE1	SH1125	Environment Science	2			2	15	15	20				50	2
IKS1	SH1126	Indian Knowledge System	2			2			40				40	2
Total			**15**	**1**	**10**	**26**	**75**	**75**	**100**	**240**	**150**	**0**	**640**	**21**

SEMESTER –II														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT-1	CT-2	TA	ESE	ICA	ESE		
BS3	SH1221	Engineering Mathematics-II	3	1		4	15	15	10	60			100	4
BS4	SH1222	Engineering Chemistry	2			2	15	15	10	60			100	2
	SH1223	Engineering Chemistry Laboratory			2	2					25		25	1
ES4	ME1221	Engineering Graphics	2			2	15	15	10	60			100	2
	ME1222	Engineering Graphics Laboratory			2	2					25		25	1
PC1	EE1221	Analog and Digital Electronics	3			3	15	15	10	60			100	3
ES5	EE1222	Analog and Digital Electronics Laboratory			2	2					25		25	1
PC2	EE1223	Energy Resources and Generation	3			3	15	15	10	60			100	3
AE2	SH1224	Modern Indian Language		2		2	15	15	20				50	2
VE2	SH1225	Universal Human Value	2			2	15	15	20				50	2
MNC1	SH1226	Yoga &Fitness			2	2			20				20	0
AE3	SH1227	Language Laboratory			2	2					25		25	1
			15	**3**	**10**	**28**	**105**	**105**	**110**	**300**	**100**	**0**	**720**	**22**

Note: In first semester, the students of Civil, Electrical, Electronics & Telecommunication, Instrumentation Engineering programmes will be offered the courses mentioned under Semester-I **AND** students of Mechanical, Computer Science Engineering and Information Technology will be offered the courses mentioned under Semester-II and in Second Semester vice-versa except Engineering Mathematics-I (SH1121) and Engineering Mathematics-II (SH1221).

Multiple Exits: Following options are available for multiple exists:

Option	NCrF Level	Qualification Title	Additional credit requirement	Bridge courses
Exit-1	4.5	One Year UG certificate course in Engg./Tech.	8	2 Months Internship **OR** Online Two skill courses at ITI Level from NSQF/ESSC/ANY Other agency which provides certification/ Evaluation @ (**Electrical Measurement and Wiring &Maintenance and Repairs of Electrical Equipment**) **OR** Technical Project
Exit-2	5.0	Two Year UG Diploma in Engg./Tech.	8	2 Months Internship **OR** Online Two skill courses at Diploma Level from NSQF/ESSC/ANY Other agency which provides certification/ Evaluation @ (**Industrial Automation & Electrical Estimating and Costing**) **OR** Technical Project
Exit-3	5.5	Three Year Bachelor Degree in Vocation. (B.Voc.) or B.Sc. (Engg./Tech.)	8	2 Months Internship **OR** Online Two skill courses at Degree Level from NSQF/ESSC/ANY Other agency which provides certification/ Evaluation @(**Solar & LED Technician & Final Assembly Operator - Magnetics**) OR Technical Project

EXIT CRITERIA FOR U. G. Certificate														
Category	**Course Code**	**Name of the Course @**	**Teaching Scheme**				**Evaluation Scheme**							**Credits**
							Theory				**Practical**		**Total**	
			TH	**TU**	**PR**	**Total**	**CT1**	**CT2**	**TA**	**ESE**	**ICA**	**ESE**		
EX1	EE1211	**Electrical Measurement and Wiring**									50		50	4
EX1	EE1212	**Maintenance and Repairs of Electrical Equipment**									50		50	4
OR														
EX1	EE1213	**Internship / Technical Project**									100@		100	8

@ Based on seminar, Internship Report, Internship/ Project evaluation

Sign
Member Secretary

Sign
BoS Chairperson

Sign
Dean, Academics

Sign
Principal

Equivalence Scheme

Programme Name: B. Tech. Electrical Engineering

S. N.	Course code with Name of course(OLD)						Course code with Name of course(NEW) (NEP Version-II)		
	Revised Curriculum 2019-20			NEP Version-I					
	Code	Name	Credit	Code	Name	Credit	Code	Name	Credit
1	EEU121	Basic Electrical Engineering	3	EE1101	Basic Electrical Engineering	2	EE1121	Basic Electrical Engineering	3
2	EEU122	Basic Electrical Engineering Laboratory	1	EE1201	Basic Electrical & Electronics Laboratory	1	EE1122	Basic Electrical Engineering Laboratory	1
3	EEU323	Energy Resources and Generation	3	EE1215	Energy Resources and Generation	3	EE1223	Energy Resources and Generation	3
4	--	--	--	--	--	--	EE1221	Analog and Digital Electronics	3
5	--	--	--	--	--	--	EE1222	Analog and Digital Electronics Laboratory	1

SEMESTER – I

Course Code	EE1121	Course Category	ES
Course Name	BASIC ELECTRICAL ENGINEERING		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	15	15	10	60	2 hrs. 30 min.	--	--	100	03

Course Objectives:

To make the students aware and understand:

1. Various fundamental methods and theorems to solve basic electrical engineering problems.
2. Concepts and terminologies of single phase and three-phase AC circuits.
3. Concepts of magnetism and operation of transformer.
4. Principle of working of various AC/DC machines, their classifications and applications.
5. Necessity of protection and electrical installations.

Course Contents:

DC Circuits
Electrical circuit elements (R, L and C), Kirchhoff's Current and Voltage Laws, Nodal and Mesh Analysis with DC source. STAR-DELTA transformation, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem.

AC Circuits
Representation of Sinusoidal Waveforms, Instantaneous, Peak and RMS values, Real power, Reactive power and apparent power. Analysis of single phase AC circuits consisting of R, L, C, RL, RC and RLC combinations for series and parallel circuits. Three-phase balanced circuits, voltage and current relationship in Star and Delta connections.

Magnetic circuits and Transformers
Basics of magnetic circuit, Series and Parallel magnetic circuits, Magnetic materials, BH characteristics, Electromagnetic Induction (self and mutual induction), Ideal and practical transformer, losses, regulation and efficiency by direct loading, Auto transformer (only concept) and three-phase transformer (only concept).

Electrical Machines
Concept of rotating magnetic fields, Construction, working, starting, and speed control of three phase induction motor, single phase induction motors and self-excited (series and shunt) and separately excited DC motors (No numerical).

Electrical Installations
Component of LT switchgear: Switch fuse unit (SFU), MCB, ELCB, MCCB, Types of Wires and cables, Necessity and types of Earthing, Elementary calculations foe energy consumption.

Text Books:

1. V. N. Mittal and B. N. Mittal, Basic Electrical Engineering, Second Edition, TATA Mc. Graw Hill, 2007.
2. Ashfaq Hussain, Fundamentals of Electrical Engineering, DhanpatRai and Co., 2010.

Reference Books:

1. L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011.
2. E. Hughes, Electrical and Electronics Technology, Pearson, 2011.
3. D. P. Kothari and I. J. Nagrath, Basic Electrical Engineering, TATA McGraw Hill, 2010.
4. B. L. Theraja, A Text Book of Electrical Technology, Vol. I &II, S. Chand & Co., 2010.
5. D. C. Kulshreshtha, Basic Electrical Engineering, TATA McGraw Hill, 2009.

Course Outcomes:

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

EE1121.1	To analyze and solve dc and ac circuits
EE1121.2	To understand the concept of magnetic circuits and transformers
EE1121.3	To calculate efficiency and regulation of transformer
EE1121.4	To understand the working principle of electrical machines
EE1121.5	To understand the components of low voltage electrical installations

CO-PO-PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
EE1121.1	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
EE1121.2	2	3	1	2	-	-	-	-	-	-	-	-	2	-	-
EE1121.3	3	2	1	2	-	-	-	-	-	-	-	-	2	-	-
EE1121.4	3	2	1	-	-	-	1	-	-	-	-	-	3	-	-
EE1121.5	2	1	1	-	-	-	-	-	-	-	-	-	2	-	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Sign Member Secretary | Sign BoS Chairperson | Sign Dean (Academics) | Sign Principal

Course Code	EE1122	Course category	ES
Course Name	BASIC ELECTRICAL ENGINEERING LABORATORY		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
--	--	02	02	--	--	--	--	--	25	--	25	01

Course Objectives:

To make the students able to:

1. Demonstrate the various laws and theorems of electrical circuits.
2. Perform the experiments on electrical machines and able to draw the conclusion from them.
3. To analyze the operation of starters for AC and DC machines.

Course Contents:

The given is the suggestive list. Teachers may take some innovative experiments.
(Minimum Eight experiments required to be performed)

List of Experiments:

1	To verify Kirchhoff's current law (KCL), Kirchhoff's voltage law (KVL) and Superposition theorem
2	To verify Thevenin's theorem and Norton's theorem
3	To estimate Real power, Reactive power and Apparent power in single phase R-L circuit.
4	To verify Voltage-Current relationship in three-phase Star-Delta AC circuit
5	To plot BH curve for a given magnetic circuit
6	To find efficiency and regulation of a single phase transformer for half full load and full load by direct loading method
7	To study starters for DC and three-phase Induction motors
8	To perform speed control of DC shunt motor using i) flux control method and ii) armature voltage control method
9	To perform load test on a DC series motor
10	To perform speed control of three-phase Induction motor using stator voltage control method
11	Study of i) SFU, MCB, ELCB and MCCB ii) Types of wires and cables and iii) Different types of Earthing

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

EE1122.1 Get an exposure to safety measures, common electrical components and their ratings.
EE1122.2 Understand the usage of common electrical measuring instruments.
EE1122.3 Understand the basic characteristics of transformers and electrical machines.

CO-PO-PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
EE1122.1	2	-	-	-	-	-	-	1	2	-	-	-	2	1	1
EE1122.2	2	-	-	-	-	-	-	1	2	-	-	-	2	1	1
EE1122.3	2	2	-	-	-	-	-	1	2	-	-	-	2	1	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

ICA - Internal Continuous Assessment shall be based on the practical record and knowledge/skills acquired. The performance shall be assessed experiment-wise by using continuous assessment formats, A and B.

SEMESTER – II

Course Code	EE1221	Course Category	PC
Course Name	ANALOG & DIGITAL ELECTRONICS		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	15	15	10	60	2 hrs. 30 min.	--	--	100	03

Course Objectives:

Students will be able aware and understand:

1. The configurations of P-N Junction Diode and Bipolar Junction Transistors.
2. The working of Operational Amplifiers.
3. The Number Systems & Boolean Algebra conversions.
4. The logics in combinational, sequential and programmable mode.

Course Contents:

Module-I: P-N Junctions - Diode theory, forward and reverse-biased junctions, reverse-bias breakdown, load line analysis, diode applications - Limiters, clippers, clampers, voltage multipliers, half wave & full wave rectification, Special purpose diodes - Zener diode, Varactor, light emitting diodes, Laser diodes.

Module-II: Bipolar Junction Transistors (BJT) - Transistor fundamentals, transistor configurations, DC operating point, BJT characteristics & parameters, fixed bias, emitter bias with and without emitter resistance, analysis of emitter bias with and without emitter resistance circuits and their design, variation of operating point and its stability.

Module-III: Operational Amplifiers - Op-Amp Basics, practical Op-Amp circuits, differential and common mode operation, Inverting & Non Inverting Amplifier, differential & cascade amplifier, Op-Amp applications.

Module-IV: Number Systems & Boolean Algebra - Decimal, binary, octal, hexadecimal number system and conversion , binary weighted codes, signed numbers, 1s and 2s complement codes, Binary arithmetic, Binary logic functions , Boolean laws, truth tables, associative and distributive properties, De-Morgans theorems, realization of switching functions using logic gates.

Module-V: Combinational Logic & Sequential Logic - Switching equations, canonical logic forms, sum of product & product of sums, Karnaugh maps, Quine-McCluskey

minimization technique, mixed logic combinational circuits, multiple output functions, Sequential circuits, flip-flops, clocked and edge triggered flip flops, timing specifications, asynchronous and synchronous counters Registers, serial in serial out shift registers.

Module-VI: Programmable Logic - Programmable logic devices, programmable read only memory, programmable logic arrays and programmable array logic, Design using PLA, field programmable gate a arrays.

Reference Books:

1. R. P. Jain, Modern Digital Electronics, McGraw Hill Education, 2009.
2. M. M. Mano, Digital Logic and Computer Design, Pearson Education India, 2016.
3. A. Kumar, Fundamentals of Digital Circuits, Prentice Hall India, 2016.
4. P. R. Gray, R. G. Meyerand, S. Lewis, Analysis and Design of Analog Integrated Circuits, John Wiley & Sons, 2001.
5. P. Horowitz and W. Hill, The Art of Electronics, Cambridge University Press, 1989.
6. A. S. Sedra and K. C. Smith, Microelectronic Circuits, New York, Oxford University Press, 1998.
7. J. V. Wait, L. P. Huelsman and G. A. Korn, Introduction to Operational Amplifier theory and applications, McGraw Hill U. S., 1992.
8. J. Millman and A. Grabel, Microelectronics, McGraw Hill Education, 1988.

Course Outcomes:

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

EE1221.1 Classify the p-n junction diode.
EE1221.2 Configure the BJT.
EE1221.3 Analyze Op-Amp.
EE1221.4 Develop the logic in sequential and combinational circuit.
EE1221.5 Understands the programmable logics.

CO-PO-PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
EE1221.1	2	-	-	-	1	1	1	-	-	-	-	-	1	-	-
EE1221.2	2	-	-	-	1	1	1	-	-	-	-	-	1	-	-
EE1221.3	2	-	-	-	1	1	1	-	-	-	-	-	1	-	-
EE1221.4	2	-	-	-	-	1	2	-	-	-	-	-	1	-	-
EE1221.5	2	-	-	-	1	-	-	-	-	-	-	-	1	-	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

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Course Code	EE1222	Course Category	ES
Course Name	ANALOG & DIGITAL ELECTRONICS LABORATORY		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
--	--	02	02	--	--	--	--	--	25	--	25	01

Course Objectives:

Students will be able aware and understand:

1. The P-N Junction Diode, Bipolar Junction Transistors and Operational Amplifiers.
2. The Number Systems & Boolean Algebra conversions.
3. The logics in combinational, sequential and programmable mode.

Course Contents:

Minimum Eight hands-on experiments related to the course contents-

1. To study V-I characteristics of PN- junction diode.
2. To study V-I characteristics of BJT.
3. To study half wave & full wave rectifier without filter and to calculate its ripple factor.
4. To study half wave & full wave rectifier with filter and to calculate its ripple factor.
5. To analysis of emitter bias with resistance circuit and their design.
6. To study Inverting / Non Inverting amplifier.
7. To study differential / cascade amplifier.
8. To verify truth table of different logic gates.
9. NOR gate as universal gate: Realization of AND/ OR/ NAND/ NOT/ EX-OR gates using NOR gates only
10. To study counters: Up counter/ down counter/ up-down counter/ decade counter
11. To study shift registers: Left shift/ right shift register
12. To study field programmable gate arrays.

Course Outcomes:

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

EE1222.1	Select the p-n junction diode & BJT.
EE1222.2	Evaluate Op-Amp.
EE1222.3	Build up the logic in sequential and combinational circuit.
EE1222.4	Understands the programmable logics.
EE1222.5	Apply the programmable logics.

ICA - Internal Continuous Assessment shall be based on the practical record and knowledge/skills acquired. The performance shall be assessed experiment-wise by using continuous assessment formats, A and B.

CO-PO-PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
EE1222.1	1	-	1	-	1	1	1	-	-	-	-	-	1	-	-
EE1222.2	1	-	-	-	1	1	1	-	-	-	-	-	1	-	-
EE1222.3	1	-	-	1	1	1	1	-	-	-	-	-	1	-	-
EE1222.4	2	-	-	-	-	1	2	-	-	-	-	-	1	-	-
EE1222.5	1	-	-	1	-	1	1	-	-	-	-	-	1	-	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

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Member Secretary	BoS Chairperson	Dean (Academics)	Principal

Course Code	EE1223	**Course Category**	**PC**
Course Name	**ENERGY RESOURCES AND GENERATION**		

Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	15	15	10	60	2 hrs. 30 min.	--	--	100	03

Course Objectives:

To make the students aware and understand:

1. The challenges of using sources of energy efficiently and effectively.
2. The energy conversion systems for various power plants.
3. The importance and relevance of renewable energy sources.

Course Contents:

Thermal and Hydro Power plant

Selection of site, working of various parts: Economizer, air preheater, condenser, cooling tower, coal handling system, ash handling system, Classification of hydro power plant according to available head, nature of load, functions of different components and their working.

Nuclear and Diesel Power plant

Methods of producing nuclear reactions, functions of different components of nuclear plant, functions of different components of diesel plant.

Solar Energy and its Measurement

Solar constants, solar radiation at earth's surface, solar radiation geometry, solar radiation measurement, estimation of average solar radiation, solar radiation on tilted surface, principle of solar energy conversion in to heat, flat plate collectors, energy balance equation and collector efficiency.

Fuel cells

Chemistry applied to fuel cells, principle and operation, classification and types of fuel cells, performance characteristics of fuel cells, classification of fuel cells system.

Wind Energy

Basic principle of wind energy conversion, wind data and energy estimation, selection of site, basic components of wind energy conversion system (WECS), classification of WEC systems, generating system, energy storage, and application of wind energy.

Other Energy Resources

Operating principle of energy from biomass. Energy from biogas, geothermal energy. MHD power generation, energy from urban and rural waste, mini and micro hydroelectric power generation.

Text Books:

1. S. B. Pandya, Conventional Energy Technology, Tata McGraw Hill, 2005.
2. G. D. Rai, Non-Conventional Energy Resources, Khanna Publishers, 2001.

Reference books and websites:

1. I. M. Campbell, Energy and Atmosphere, Wiley, New York, 2006.
2. S. P. Sukhatme, Solar Energy, Tata McGraw Hill, 2006.
3. B. H. Khan, Non-Conventional Energy Resources, Tata McGraw Hill, 2003.

Useful Links:

1. https://archive.nptel.ac.in/courses/108/105/108105058/
2. www.ocw.mit.edu

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

EE1223.1 List and explain the main sources of energy and their primary applications nationally and internationally.

EE1223.2 Understand the energy scenario and the consequent growth of the power generation from renewable energy sources.

EE1223.3 Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the impact on the environment.

EE1223.4 Understand the basic principle of wind and solar power generation, fuel cells and energy from bio-mass.

EE1223.5 Understand the issues related to the grid-integration of solar and wind energy systems.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
EE1223.1	2	-	-	-	1	1	1	-	-	-	-	-	1	-	-
EE1223.2	2	-	-	-	1	1	1	-	-	-	-	-	1	-	-
EE1223.3	2	-	-	-	1	1	1	-	-	-	-	-	1	-	-
EE1223.4	2	-	-	-	-	1	2	-	-	-	-	-	1	-	-
EE1223.5	2	-	-	-	1	1	2	-	-	-	-	-	2	-	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

EXIT COURSES (After B. Tech. I Year)

Course Code	EE1211							Course Category		EX
Course Name	ELECTRICAL MEASUREMENT AND WIRING									
Teaching Scheme				Examination Scheme						Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
--	--	--	--	--	--	--	---	50	--	50	04

Course Objectives:

To make the students able to:

1. Understand measuring instruments and measure various electrical parameters.
2. Design and test domestic wiring.
3. Design and test industrial and commercial wiring

Course Contents:

Electrical Measurements:

Measurement of voltage, current & resistance in different circuits.
Direct & indirect measurement of electrical power & energy. Calibration of energy meters.
Measurement of current and voltage using CT & PT, Measurement of 3-Phase energy using CT & PT. Phase sequence meter, measure current and voltage using Tong tester.
Power measurement by Two & Three wattmeter method, Insulation resistance test by Megger. Measurement of earth resistance by earth tester.
Calibration of indicating type analogue instruments: voltmeter, ammeter, and wattmeter. Measurement of soil conductivity. Introduction of Digital meters.

Domestic Wiring:

Connecting common electrical accessories in circuits and testing them in series board.
Testing & replacement of different types of fuses.
Identification of different wiring materials and their specifications.
Crimping thimbles/lugs of various sizes.
Layout of wiring boards.

Industrial Wiring:

Tests on insulating materials.
Measurement of insulation resistance, of commercial and industrial installation.
Industrial power wiring involving single phase & 3-phase motors with switches & starters.

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Commercial Wiring:

Inverter wiring, Control panel wiring, multistoried building wiring.
Introduction to LAN wiring.
Installation of single-phase and three-phase on line / off line UPS wiring.
Testing of Industrial wiring and UPS wiring installation.
Industrial wiring installations for mixed load, both light and power.
Layout of L.V. AC/DC machines and their panels.
Wiring of Low power A.C./ D.C. machines in metal conduit system as per I.E. Rules.
Testing of wiring installation.

Text Books:

1. A. K. Sawhney, A course in Electrical, Electronics Measurement and Instrumentation, 5th Edition, Dhanpat Rai & Sons, 2006
2. Satheesh Kumar, Electrical Wiring – An Introduction, Ane Books Pvt. Ltd., New Delhi
3. S. L. Uppal, Electrical Wiring, Estimating and Costing, Khanna Publisher, New Delhi

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

EE1211.1 Measure various electrical parameters selecting proper measuring instrument
EE1211.2 Extend the range of measuring instruments
EE1211.3 Design and test domestic wiring
EE1211.4 Design and test industrial wiring
EE1211.5 Design and test commercial wiring

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
EE1211.1	2	-	-	-	1	1	1	-	-	-	-	-	1	-	-
EE1211.2	2	-	-	-	1	1	1	-	-	-	-	-	1	-	-
EE1211.3	-	-	-	-	1	1	1	-	-	-	-	-	1	-	-
EE1211.4	2	-	-	-	-	1	2	-	-	-	-	-	1	-	-
EE1211.5	2	-	-	-	1	1	2	-	-	-	-	-	2	-	-

0 - Not Correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

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Course Code	EE1212								Course Category			EX
Course Name	MAINTENANCE AND REPAIRS OF ELECTRICAL EQUIPMENT											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT1	TA	ESE	ESE Duration	ICA	ESE		
--	--	--	--	--	--	--	--	--	50	--	50	04

Course Objectives:

To make the students aware and understand:

1. Test different electrical equipment as per I. S.
2. Prepare cost & estimate of repairs & selection of components.
3. Fault finding and fault repair.

Course Contents:

Introduction:

Principle different effects of electric currents, materials used in electrical equipments, tools/ instruments necessary for repair works, jointing methods, soldering, testing of instruments, Interpretation, location & identification of faults, recording/ estimation of materials/ components required & their cost, approximate costing of repair of equipment.

Domestic electrical equipment:

Principle, types, construction, operation, testing, fault finding, dismantling, assembly & testing after repairs of following equipments: electric Iron all types, electric ovens, electric fans & regulators, water heaters, geysers mixers, food processors, toasters.

Circuits used for control & regulation of electronic circuits:

Circuits used for control & regulation of electronic circuits like rectifiers amplifier timer, oscillator, identification of component, component testing with multimeter, replacement of components, microwave & use microwave for heating, laser & laser equipment.

Advanced equipments:

Advanced equipments principle, types, construction, operation, Testing, fault finding, dismantling, assembly & testing after repairs of following equipments - UPS / Inverters, battery chargers, microwaves ovens, air coolers, washing machines – semi automatic / fully automatic, remote controllers of different equipments, VCD / DVD / ACD players.

Text Books:

1. Dr. Umesh Rathore & N. K., A Text Book of Electrical Workshop Practice, S. K. Kataria & Sons, 2023.

Reference books and websites:

1. Service Manuals of manufacturers.

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

EE1212.1 Identify faults in domestic appliances
EE1212.2 Identify specific tools for maintenance
EE1212.3 Select appropriate UPS / Inverters for given application
EE1212.4 Understand the basic working principle of Domestic appliances
EE1212.5 Understand the issues related to the grid-integration of solar and wind energy systems.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
EE1212.1	2	-	-	-	1	1	1	-	-	-	-	-	1	-	-
EE1212.2	2	-	-	-	1	1	1	-	-	-	-	-	1	-	-
EE1212.3	2	-	-	-	1	1	1	-	-	-	-	-	1	-	-
EE1212.4	2	-	-	-	-	1	2	-	-	-	-	-	1	-	-
EE1212.5	2	-	-	-	1	1	2	-	-	-	-	-	2	-	-

0 - Not Correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Curriculum Structure for B. Tech. Civil Engineering Programme

(In light of NEP 2020)

NCrF Level 6

(NEP_ Version II)

For students admitted in 2024-25 onwards

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

Near Kathora Naka, Amravati, Maharashtra
PIN 444604
www.gcoea.ac.in

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Member Secretary

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Sign
Dean (Academics)

Sign
Principal

Structure for B. Tech. Programme in light of NEP 2020

For students admitted in 2024-25 onwards

Key Features of Curriculum

1. Multiple entry and exit option after every year.
2. Provision for Open Electives (OE), Vocational and Skill Enhancement Courses (VSE), Ability Enhancement Courses (AE), Indian Knowledge System (IKS), Value Education Courses (VE), Co-Curricular Courses (CC) in addition to program core courses.
3. Mandatory internship of one semester.
4. Credits for Value education courses, Ability Enhancement Courses, Co-Curricular Curricular Activities.
5. Mandatory Non-Credit Courses.
6. Interdisciplinary and multidisciplinary education through single and double minors and open electives.
7. Skill based courses and multiple exit level.
8. Provision for learning in online mode through Swayam/ NPTEL etc courses
9. Provision for B.Tech. Honours with Research degree through research project.
10. Opportunity for learner to choose courses of their interest in all disciplines.
11. Provision of Skill Based Courses and internship/Field project/mini projects for exit options at each level.
12. Flexibility for all types of learners i.e. Good, Normal and Exit

Good Students	Normal Students	Exit
B. Tech. Major with Multidisciplinary Minor	B. Tech. Major with Multidisciplinary Minor	Additional 08 credits in the form of skill-based courses / labs, internship, mini projects shall be offered in 8 weeks.
B. Tech. Honors and Multidisciplinary Minor	--	
B. Tech. Honors with Research and Multidisciplinary Minor	--	
B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	--	

Credit Distribution for each year and Exit Option

NCrFLevel	Year / Semester	Exit Option	Credits	Additional Credits for exit students	Total Credits
4.5	Semester I & II	U. G. Certificate	43	08	51
5.0	Semester III & IV	U. G. Diploma	84	08	92
5.5	Semester V & VI	B. Vocational/B.Sc. Engg.	127	08	135
6.0	Semester VII & VIII	B. Tech.Major with Multidisciplinary Minor	167	--	167
		B. Tech. Honors and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. Honors with Research and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	167+18=185	--	185

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Principal

Course Category-wise Credit Distribution

Course Category	As per NEP GR	GCOEA Credits	CC	As per NEP GR	GCOEA Credits
BSC/ESC	30	30	BS	14-18	15
			ES	16--12	15
Program Courses	64-76	67	PC	44-56	47
			PE	20	20
Multidisciplinary Courses	22	22	MM	14	14
			OE	8	8
Skill Courses	8	8	VSE	8	8
Humanities, Social Science & Management (HSSM)	14	14	AE	4	4
			EM	4	4
			IKS	2	2
			VE	4	4
Experiential Courses	22	22	RM	4	4
			FP	2	2
			PR	4	4
			IN/OJT	12	12
Liberal Learning Courses	4	4	CC	4	4
Total Credits	**160-176**	**167**		**160-176**	**167**

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BoS Chairperson

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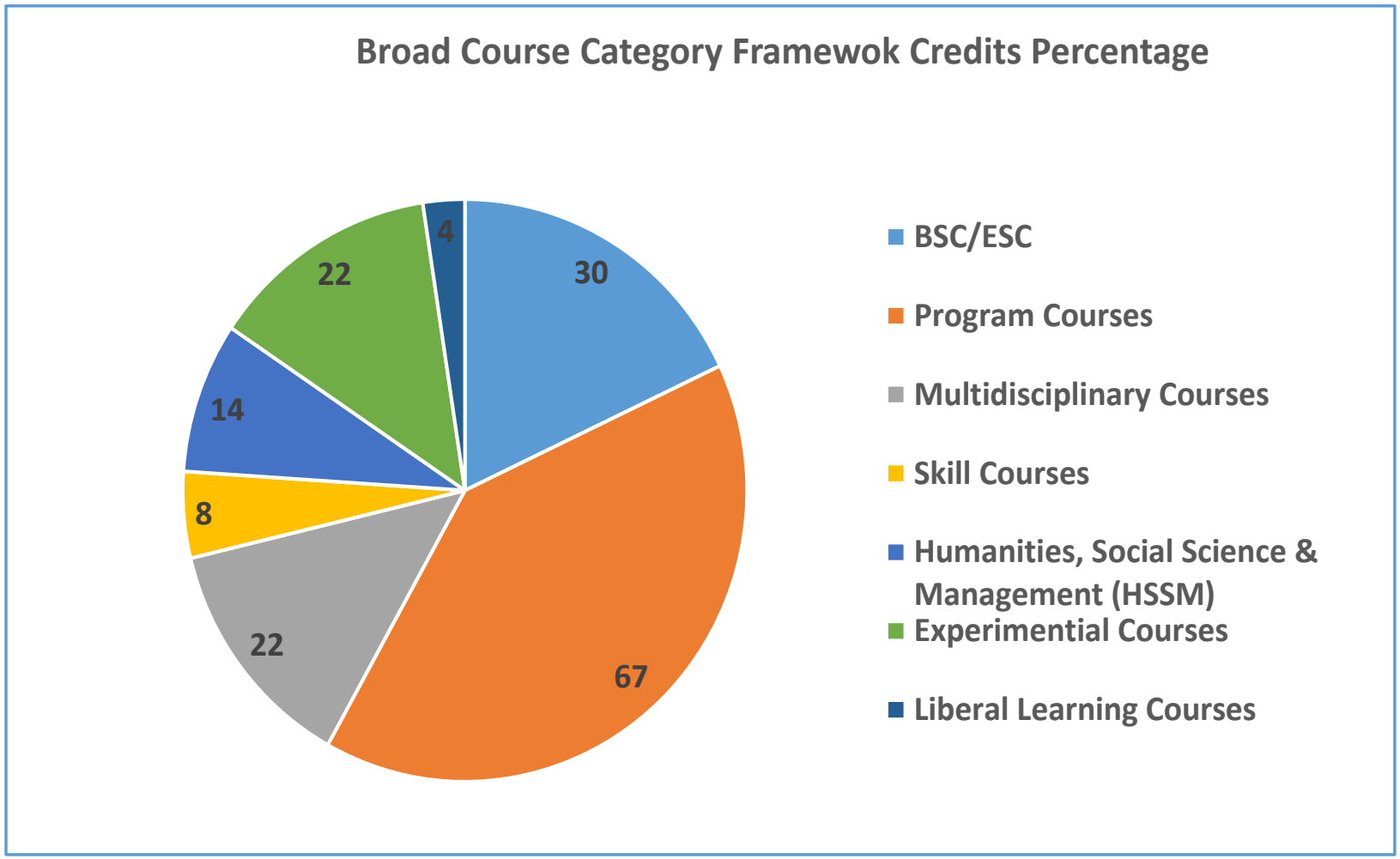
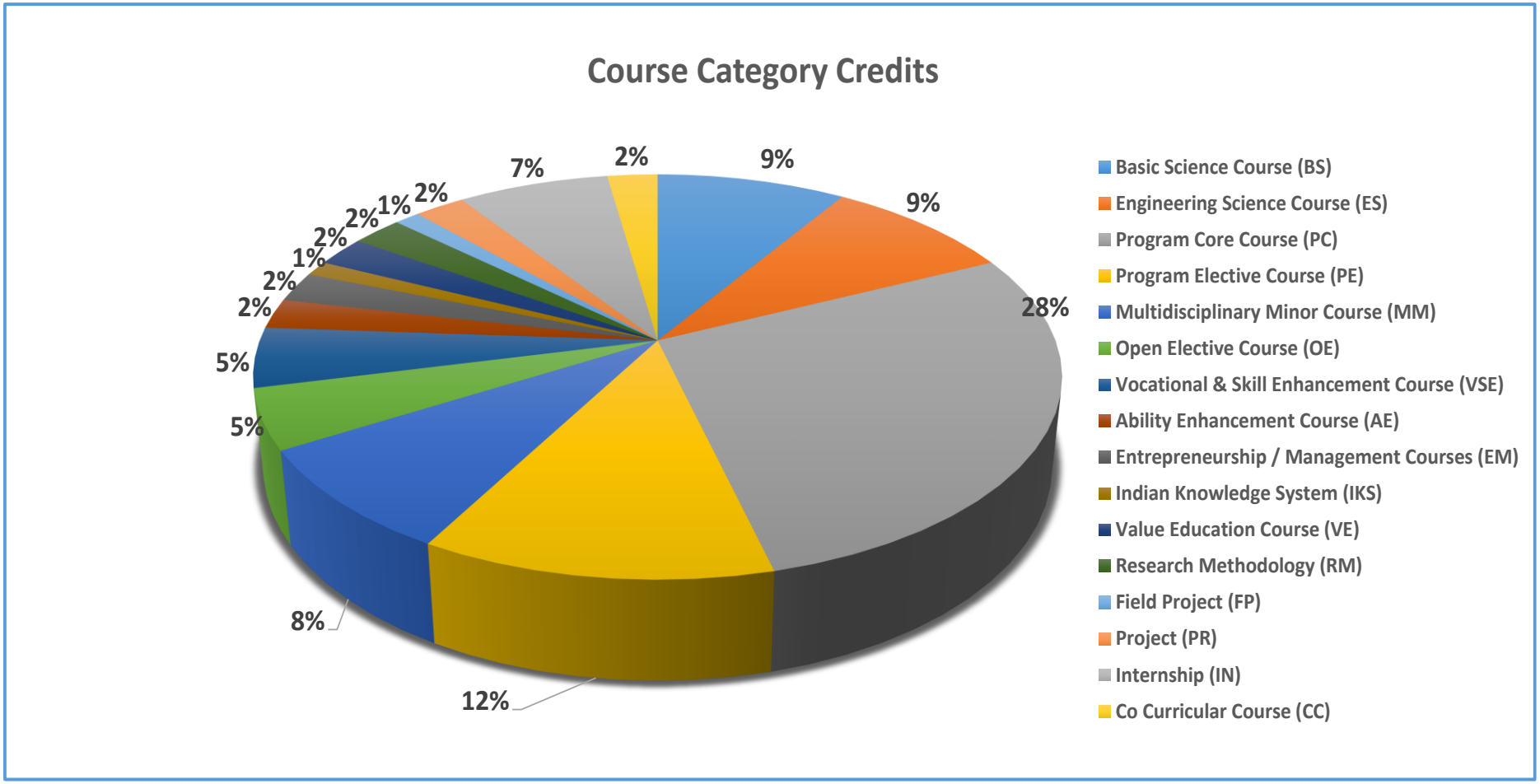
Principal


Broad Course Category Framewok Credits Percentage
30
67
22
8
14
22
4
BSC/ESC
Program Courses
Multidisciplinary Courses
Skill Courses
Humanities, Social Science & Management (HSSM)
Experimental Courses
Liberal Learning Courses


Course Category Credits
9%
9%
28%
12%
8%
5%
5%
2%
2%
1%
2%
2%
1%
2%
7%
2%
Basic Science Course (BS)
Engineering Science Course (ES)
Program Core Course (PC)
Program Elective Course (PE)
Multidisciplinary Minor Course (MM)
Open Elective Course (OE)
Vocational & Skill Enhancement Course (VSE)
Ability Enhancement Course (AE)
Entrepreneurship / Management Courses (EM)
Indian Knowledge System (IKS)
Value Education Course (VE)
Research Methodology (RM)
Field Project (FP)
Project (PR)
Internship (IN)
Co Curricular Course (CC)

Semester-wise Credit Distribution

Sr. No.	SEM	I	II	III	IV	V	VI	VII	VIII	Total Credits	NEP Requirement
1	Basic Science Course (BS)	8	7							15	14-18
2	Engineering Science Course (ES)	8	7							15	12-16
3	Program Core Course (PC)		3	15	11	8	7	3		47	44-56
4	Program Elective Course (PE)					4	8	8		20	20
5	Multidisciplinary Minor Course (MM)			3	3	3	3	2		14	14
6	Open Elective Course (OE)				3	3		2		8	8
7	Vocational & Skill Enhancement Course (VSE)			2	1	2	1	2		8	8
8	Ability Enhancement Course (AE)	1	3							4	4
9	Entrepreneurship / Management Courses (EM)			1					3	4	4
10	Indian Knowledge System (IKS)	2								2	2
11	Value Education Course (VE)	2	2							4	4
12	Research Methodology (RM)								4	4	4
13	Field Project (FP)						2			2	2
14	Project (PR)							4		4	4
15	Internship (IN)								12	12	12
16	Co Curricular Course (CC)				2	2				4	4
	Total Credits	**21**	**22**	**21**	**20**	**22**	**21**	**21**	**19**	**167**	164-176

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General Instructions:

(1) 10% content of syllabus of each theory course shall be completed by the students with self-study. The 10% portion of each course (for self-study) shall be declared by the concerned course-coordinator at the beginning of teaching of the course.

(2) Student can complete **any Course** or programme elective courses PE1 to PE5 in "online" mode, offered through SWAYAM/ NPTEL portal or equivalent platform which provides Evaluation mechanism with the permission of Departmental Faculty Board (DFB). In this case –

(i) Students can register and complete these online courses any time after beginning of third semester, however, the student must successfully complete and pass the course, and submit the score card/certificate before declaration of result of respective semester in which the course is being offered.

(ii) In case, if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute in respective semester as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the course, and successfully complete the course.

(3) In eighth semester, the students have to complete mandatory internship of one semester in the company/ organization approved by the DFB.

(4) In eighth semester during internship, the students have to complete the theory courses in any one of the two modes:

(i) **Online courses** offered through SWAYAM/ NPTEL or equivalent platform which provides Evaluation mechanism with the permission of DFB: In this case, students can register and complete these online courses any time after beginning of third semester and complete the course and submit the score card/ certificate before declaration of result of eighth semester.

In case if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the course personally as per the schedule declared by the institute, and successfully complete the course.

(ii) **Self-study mode:** In this case the student will have to study the course offered by the institute of his/her own. The student shall appear for all the college assessments/ examinations (CT1/CT2, TA and ESE) personally as per the schedule declared by the institute and successfully complete the course.

(5) In addition to program specific courses, the students have to complete vocational skill courses, internship, field projects connected to **major degree**.

(6) Exit Option:

The exit option at the end of each year will be available to students after even semester. e. 2nd semester, 4th semester &6th semester and will commence from AY 2024-25 for UG Certificate, AY 2025-26 for UG Diploma, AY 2026-27 for B. Voc./B. Sc. Engineering degree.

(7) Students opting for exit at any level (after odd semesters or even semester) will have to earn additional eight credits before exit in skill based vocational courses and internship/apprenticeship/mini project to make them eligible to get UG certificate / UG Diploma or B. Voc./B. Sc. Engineering degree as per eligibility.

(8) Re Entry and Lateral Entry: Students opting for exit at any level after even semester, will have the option to re-enter the programme from where they left off in odd semesters within **four years of exit.** There shall be a gap of at least **one year** between exit and re-entry to UG programme.

(9) Students opting for exit after odd semester, i.e. 1st, 3rd, 5th or 7th semester will have the option to re-enter the programme from where they left off in even semesters only. There shall be a gap of at least **one year** between exit and re-entry to UG programme.

(10) Maximum period for completion of B. Tech. programme:

The student has to complete the degree programme within the stipulated **maximum period of eight years** from the date of admission to first year UG. The maximum duration of the programme includes the period of exit, withdrawal, absence and different kinds of leaves permissible to a student but it shall exclude the period of rustication of the student from the institute. However, genuine cases on confirmation of valid reasons may be referred to Academic Council for extending this limit by **additional one year**.

(11) Eligibility for admission to the UG Bachelor's Degree with Honours/ Research/Double Minor:

Students with minimum **CGPA of 7.5** without backlog courses at the end of fourth semester and should have earned 84 **credits** are eligible for admission to the UG Bachelor's Degree with Honours/ Research/ Double Minor.

SEMESTER –I															
Category	**Course Code**	**Name of the Course**	**Teaching Scheme**				**Evaluation Scheme**								**Credits**
							Theory				**Practical**		**Total**		
		Induction Program	TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE			
BS1	SH1121	Engineering Mathematics-I	3	1		4	15	15	10	60			100		4
BS2	SH1122	Engineering Physics	3			3	15	15	10	60			100		3
	SH1123	Engineering Physics Laboratory			2	2					25		25		1
ES1	**CE1121**	**Building Construction**	3			3	15	15	10	60			100		3
	CE1122	**Building Construction Laboratory**			2	2					25		25		1
ES2	CS1121	Programming for Problem Solving	2			2	15	15	10	60			100		2
	CS1122	Programming for Problem Solving Laboratory			2	2					25		25		1
ES3	ME1121	Workshop Practices			2	2					25		25		1
AE1	SH1124	Communication Skill			2	2					50		50		1
VE1	SH1125	Environment Science	2			2	15	15	20				50		2
IKS1	SH1126	Indian Knowledge System	2			2			40				40		2
Total			**15**	**1**	**10**	**26**	**75**	**75**	**100**	**240**	**150**		**640**		**21**

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SEMESTER –II														
Category	**Course Code**	**Name of the Course**	**Teaching Scheme**				**Evaluation Scheme**							**Credits**
							Theory				**Practical**		**Total**	
			TH	TU	PR	Total	CT-1	CT-2	TA	ESE	ICA	ESE		
BS3	SH1221	Engineering Mathematics-II	3	1		4	15	15	10	60			100	4
BS4	SH1222	Engineering Chemistry	2			2	15	15	10	60			100	2
	SH1223	Engineering Chemistry Laboratory			2	2					25		25	1
ES4	ME1221	Engineering Graphics	2			2	15	15	10	60			100	2
	ME1222	Engineering Graphics Laboratory			2	2					25		25	1
ES5	**CE1221**	**Engineering Mechanics**	3			3	15	15	10	60			100	3
	CE1222	**Engineering Mechanics Lab**			2	2					25		25	1
PC1	**CE1223**	**Basics of Civil Engineering**	3			3	15	15	10	60			100	3
AE2	SH1224	Modern Indian Language		2		2	15	15	20				50	2
VE2	SH1225	Universal Human Value	2			2	15	15	20				50	2
MNC1	SH1226	Yoga &Fitness			2	2			20				20	0
AE3	SH1227	Language Laboratory			2	2					25		25	1
			15	**3**	**10**	**28**	**105**	**105**	**110**	**300**	**100**		**720**	**22**

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Note : In first semester , the students of Civil, Electrical, Electronics & Telecommunication ,Instrumentation Engineering programmes will be offered the courses mentioned under Semester-I **AND** students of Mechanical , Computer Science Engineering and Information Technology will be offered the courses mentioned under Semester-II and in Second Semester Vice-versa except Engineering Mathematics-I (SH1101) and Engineering Mathematics-II (SH1201).

Equivalence Scheme

Programme Name:-B. Tech. Civil Engineering

S N.	Course code with Name of course (old)						Course code with Name of course(NEW) (NEP Version-II) 2024-25		
	Revised Curriculum 2019-20			NEP Version I 2023-24					
	Code	Name	Credit	Code	Name	Credit	Code	Name	Credit
01	CEU322	Building Materials and Construction	03	-	-	-	CE1121	Building Construction	03
02	CEU325	Building Materials and Construction Lab	01	-	-	-	CE1122	Building Construction Lab	01
03	CEU121	Engineering Mechanics	03	CE1201	Engineering Mechanics	02	CE1211	Engineering Mechanics	03
04	CEU122	Engineering Mechanics Lab	01	CE1202	Engineering Mechanics Lab	01	CE1223	Engineering Mechanics Lab	01
05	-	-	-	CE1215	Basic Civil Engineering	03	CE1223	Basics of Civil Engineering	03

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Multiple exits: Following options are available for multiple exists:

Option	NCrF Level	Qualification Title	Additional credit requirement	Bridge courses
Exit-1	4.5	One year UG certificate course in Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at ITI Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project
Exit-2	5.0	Two year UG Diploma I Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at Diploma Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project
Exit-3	5.5	Three year Bachelor Degree in Vocation (B.Voc) orB.Sc. (Engg./Tech)	8	2 Month Internship **OR** Online Two skill courses at Degree Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project

EXIT CRITERIA FOR U. G. Certificate														
Category	**Course Code**	**Name of the Course @**	**Teaching Scheme**				**Evaluation Scheme**							**Credits**
							Theory				**Practical**		**Total**	
			TH	**TU**	**PR**	**Total**	**CT1**	**CT 2**	**TA**	**ESE**	**ICA**	**ESE**		
EX1	CE1211	**Civil Engineering Survey**									50		50	4
EX1	CE1212	**Testing of Civil Engineering Materials**									50		50	4
OR														
EX1	CE1213	**Internship / Technical Project**									**100 @**		**100**	**8**

@ Based on seminar, Internship Report, Internship/ Project evaluation

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Course Code	**CE1121**							Course category			ES1
Course Name	**Building Construction**										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
3	-	-	3	15	15	10	60	2 hr 30 min	-	-	-	03

Course Objectives:

To make the students aware and understand:

1. Basic concept of building construction
2. Various types of buildings according to National Building Code
3. Various components of building, their types and functions
4. Various construction processes
5. Special aspects of constructions
6. Temporary structures required for construction of various building components

Course Contents:

Introduction: Types of building as per National Building Code, Components of buildings and their functions, Types of structures-load bearing, framed and composite structures, their suitability, relative advantages and disadvantages

Foundation: Definition, purpose, Loads acting on foundation, Safe bearing capacity of soil-definition, Types of shallow foundation for buildings-spread footings for walls and columns, combined footing for columns, Raft foundation, Setting out for foundation.

Floors & **Floor finishes:** Floors- Definition & purpose, Types of R.C.C. floors-R.C.C. slab floor, R.C.C. slab & beam floor, Ribbed floor, Flat Slab, their suitability and construction procedure, Flooring tiles: Types-plain cement tiles, Mosaic tiles, chequered tiles, ceramic tiles, glazed tiles, P.V.C. flooring tiles, Vitrified Tiles

Doors Doors-Purpose, Criteria for location, Sizes, Types of door frames, Methods of fixing door frames, Types of door shutters- fully panelled, flush, louvered, glazed, sliding, revolving, rolling shutter, collapsible door, grilled door, suitability of different types of doors. Types of aluminium doors

Windows: Purpose, Criteria for location, Sizes, Types of wooden windows-casement, louvered, glazed, metal windows, Aluminium windows, Corner & bay windows, Ventilators-purpose and types, Grills for windows

Lintels: Lintels-purpose, types and their suitability, details of R.C.C. lintel

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Stairs: Function, Technical terms, Criteria for location, Requirements of good stair, Types of stairs and their suitability, Design of stair, Lifts types and their suitability, Ramps, Escalators

Roofs: Flat & pitched roofs-suitability, Types of steel roof trusses and their suitability, Placing and fixing trusses, Types of roofing sheets, Fixing of roofing sheets to trusses

Masonry construction:

Brick Masonry: Qualities of good bricks, Field and laboratory tests on bricks, Classification of bricks, Mortars: Types of mortars and their suitability, Proportion of mortars used for different works, Technical terms in brick masonry, Principles to be observed during construction, Header bond, Stretcher bond, English Bond, Flemish bond (I & 11/2 brick thick walls), Construction procedure, defects in brick masonry

Reinforced Brick masonry: Applications, Advantages, Materials required, Construction

Concrete block masonry: Types-solid and hollow, common dimensions, Construction procedure

Plastering and pointing: Purpose, Types and their suitability, Procedure of plastering and pointing, Defects in plastering work

Damp proofing: Causes and effects, Methods of damp proofing, materials required, Water proofing compounds- suitability and uses. Details of cavity wall construction

Termite Proofing: Definition, Methods of Termite Proofing

Joints in structure: Construction joints-necessity, provision of construction joint in slab, beam and columns, Expansion joints -necessity, location, materials used, details of expansion joints at foundation and roof level for a load bearing and framed structure.

Formwork & **scaffolding:** Form work-types and suitability, Period for removal of formwork, scaffolding: necessity, Types, Details of erections

Text Books:

1. Sushil Kumar, Building Construction, 19th edition, Standard Publishers Distributors, New Delhi.2008
2. P.C. Verghese, Building Materials, , I st edition, Prentice-Hall of India, New Delhi, 2009.
3. Saurabh Kumar S oni,, S. K. Kataria and Daryaganj, Building Materials and Construction, New Delhi -11000

Reference Books:

1. National Building Code of India 2005, B.I.S., 2nd revision, Techniz Books International, New Delhi,2005
2. FPA 5000: Building Construction & Safety Code, FPA, Techniz Books International, New Delhi, 200.
3. Building Materials & Components for Developing Countries, C.B.R.I., Tata Mc- Graw Hill Publishing Co. New Delhi, 1990
4. Gurucharan Singh, Building Construction, 11 th Edition, Standard Book House, New Delhi 2010.

Course Outcomes:

After Completion of course students will be able to:

CE1121.1: explain various types of Buildings and their suitability

CE1121.2: classify and explain basic components of building

CE1121.3: Explain the importance and role of each component of building

CE1121.4: explain various construction processes for various construction works/ components

CE1121.5: Explain temporary structures required for construction of various building components

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1121.1	0	0	0	0	0	0	1	1	2	0	0	1	0	3	1
CE1121.2	0	0	0	0	0	0	1	1	2	0	0	1	0	3	1
CE1121.3	0	0	0	0	0	0	1	1	2	0	0	1	0	3	1
CE1121.4	0	0	0	0	0	0	1	1	2	0	0	1	0	3	1
CE1121.5	0	0	0	0	0	0	1	1	2	0	0	1	0	3	1

Course Code	**CE1122**						Course category			ES1
Course Name	**Building Construction Lab**									
Teaching Scheme				Examination Scheme						Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	25	-	25	01

Course Objectives:

To make the students aware and understand:

1. To draw the section of load bearing and framed structure
2. To draw the free hand sketches of various components of abuilding
3. To draw freehand sketches of various bonds in brick masonry
4. To draw the free hand sketches of temporary structures

List of Practical:

I. Drawing free-hand sketches in the Sketch book of following building components

1. Section of typical load bearing and framed structure
2. Different types of foundations
3. Different types of R.C.C. Floors
4. Different types of doors
5. Different types of windows
6. Different types of lintels
7. Line diagrams of different types of steel roof trusses
8. Different types of stairs (plan and elevations)
9. Types of bonds in brick masonry -plan and elevation of stretcher & header bond, one brick thick wall in English and Flemish bond, brick columns
10. Expansion joints at foundation and roof level in load bearing and framed structure
11. Any one type of scaffolding (elevation and section)
12. Form work for R.C.C. floor
13.

II Setting out foundation plan for two room building on field

Note:

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge/ skill acquired. The performance shall be assessed exercise wise using continuous assessment in formats A & B.

Course Outcomes:

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

CE1122.1 Draw free hand sketches various buildings components

CE1122.2 Draw free hand sketches of brick masonry bonds

CE1122.3 Setting out of foundation plan in the field

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1122.1	0	0	0	0	0	0	1	1	3	0	0	1	0	3	1
CE1122.2	0	0	0	0	0	0	1	1	3	0	0	1	0	3	1
CE1122.3	0	0	0	0	0	0	1	1	3	0	0	1	0	3	1

Course Code	CE1221							Course category			ES5
Course Name	Engineering Mechanics										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	100	2 hrs 30 min	-	-	-	03

Course Objectives:

To make the students aware and understand:

1. Applications of principles of mechanics for solutions of various engineering problems
2. Problem solving abilities and to enhance their analytical abilities
3. Fundamental concepts before going for higher level courses

Course Contents

Force System

Introduction to the principles of mechanics, general force system, moment of a force about a point and about an axis, couple and couple moment, couple moment as free vector, moment of couple about a line, resolution and composition of coplanar force system, Reduction of system of forces into a force couple system, Simple resultant, Resultant and equilibrium of two dimensional force system, Support reaction of simply supported and overhang beam under different types of loading

Trusses, Cables and Friction

Analysis of plane simple Trusses, method of joints, method of section, Static analysis of cables for point loads

Concept of friction, impending motion, angle of friction, angle of repose, cone of friction, Coulombs laws of dry fiction, wedge blocks, belt friction, Concept of dynamic friction

Centroid and Moment of Inertia

Centroid of plane areas, second moment of area, and product of inertia, perpendicular and parallel axis theorem, polar moment of inertia, Principal moment of inertia

Simple Stresses & Strain

Simple Stresses and Strains: Concept of stress and strain, St. Venants principle, types of stresses and strains, Hooke's law, stress-strain diagram for mild steel and brittle material.

Working stress, factor of safety, lateral strain, Poisson's ratio and volumetric strain, Elastic constants and relationship among them

Dynamics

Kinematics: Rectilinear motion under constant and variable acceleration, motion curves, Simple relative motion between two particles, kinematics of rigid body

Kinetics: kinetics of a particle acted upon by a constant and variable force System, Newton's Second law. D'Alembert's Principle, Impulse momentum principle, work energy equation for rigid bodies, concept of dynamic equilibrium

Text Books

1. Dr. K. L. Kumar, Engineering Mechanics, Tata McGraw Hill Publications, 2011
2. V. S. Mokoshi, Engineering Mechanics, Vol. 1 – Statics and Vol. 2 – Dynamics,Tata McGraw Hill Books, 1996
3. Shames, I. H. and Rao,G. K., "Engineering Mechanics: Statics and Dynamics, Pearson 4thEd, 2006,

Reference Books and Websites

1. Meriam, J. L. and Kraige, L. G., Engineering Mechanics, Volume 1: Statics, Volume 2: Dynamics, 8th Ed , Wiley, 2017,
2. Beer and Johnston Vector Mechanics for Engineers: Statics and Dynamics, , Tata McGraw Hill Books, 10th Ed , 2012,
3. Nelson A., Engineering Mechanics: Statics and Dynamics, Tata McGraw Hill Books, 2017
4. R. C. Hibbeler, Engineering Mechanics, Pearson Publishers, 2010
5. SCHAUM Series, Intermediate Engineering Mechanics, McLean, 3rd Edition, 1995
6. http://www.nptelvideos.com/mobilevideo.php?id=1514

Course Outcomes

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

CE1221.1	Determine resultant forces, moments and resolve them
CE1221.2	Use the principle of mechanics to solve structures like trusses, Cables and also able to calculate effects of friction for solving problems
CE1221.3	Understand basic concepts of stress-strain, and evaluate behavior and other physical properties of elastic isotropic materials
CE1221.4	Evaluate centroid, moment of inertia and Principal moment of inertia
CE1221.5	Understand basic concepts of Dynamics

CO – PO – PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1221.1	3	3	0	1	0	0	0	0	0	0	0	1	2	1	0
CE1221.2	3	3	0	1	0	0	0	0	0	0	0	1	2	1	0
CE1221.3	3	3	0	1	0	0	0	0	0	0	0	1	2	1	0
CE1221.4	3	3	0	1	0	0	0	0	0	0	0	1	2	1	0
CE1221.5	3	3	0	1	0	0	0	0	0	0	0	1	2	1	0

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	CE1222	Course category	ES5
Course Name	**Engineering Mechanics Lab**		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	-	-	-	-	-	-	-	25	-	25	01

Course Objectives:

To make the students aware and understand

1. Principles of mechanics experimentally.
2. Graphical methods /machines for the solution of mechanics problems.
3. Motion of a particle/ rigid bodies in terms of its position, velocity and acceleration in different frames of reference.

Course Contents:

It is a representative list of practical with minimum of **eight** experiments with graphical solutions & use of machines. The instructor may choose experiments as per his requirements (so as to cover the entire contents of the course) from the list or otherwise.

1. Determination of resultant of coplanar concurrent force system by law of polygon of forces.
2. Determination of reactions at the supports of simple supported beam.
3. Determination of forces in the members of Jib crane.
4. Determination of coefficient of friction between inclined glass planes and different blocks.
5. Determination of coefficient of friction between belt and fixed drum.
6. Determination of mechanical advantage, velocity ratio and efficiency of simple screw jack machine.
7. Determination of mechanical advantage, velocity ratio and efficiency of machine. (such as differential wheel axle machine, single purchase crabs machine, double purchase crabs machine, worm and worm wheel machine etc)
8. Determination of moment of inertia of flywheel.
9. Verification of Newton's second law of motion by Fletcher's trolley.
10. Motion curves for particles / rigid bodies.
11. Inversions of four bar and Slider Crank Mechanism:
12. Gears and Gear Trains: Spur gear (single and Multi-Stage), Helical Gear, Bevel gear, Herringbone gear, Worm gear, Rack and pinion arrangement;
13. Determine the mass moment of inertia of a given object using trifler Pendulum

14. Determination of forces in the members of trusses by graphical method.

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CE1222.1 conduct laboratory experiments to determine MI, forces, reactions, moments and friction coefficient.

CE1222.2 conduct laboratory experiments on simple machine to determine their efficiency.

CE1222.3 conduct laboratory experiment to verify laws of mechanics

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1222.1	2	1	0	1	0	0	0	0	1	1	0	0	2	1	0
CE1222.2	2	1	0	1	0	0	0	0	1	1	0	0	2	1	0
CE1222.3	2	1	0	1	0	0	0	0	1	1	0	0	2	1	0

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

ICA – Internal Continuous Assessment shall be based on the practical record and knowledge/ skills acquired. The performance shall be assessed experiment wise using continuous assessment formats, A and B.

Course Code	CE1223	Course category	PC1
Course Name	**Basics of Civil Engineering**		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	100	2 hrs 30 min	-	-	-	03

Course Objectives:
To make the students aware and understand:

1. Importance of Civil Engineering and role in Civil Engineer in infrastructure development and various branches / systems of Civil Engineering
2. Various activities in a Civil Engineering Project
3. Various construction materials and their applications in construction
4. Building Planning, drawings and Estimates

Course Contents:

Introduction

Introduction to Civil Engineering, Civil Engineering Projects, Role of Civil Engineer in construction activities, , Importance of Civil engineering in infrastructure development of the country

Investigations

Data collection for planning and design, Topographical investigations – surveying and levelling, Geological Investigations, Geotechnical Investigations, Hydrological Investigations,

Construction materials

Construction materials- Building stones, sand, aggregates, bricks –types and dimensions, Qualities of good bricks, Classification of bricks, cement-types and grades, mortar, P.C.C R.C.C- Grades, Solid and concrete blocks, ACC blocks, Reinforcement- Types and grades, M.S. Rolled steel sections, Aluminium sections, Roof coverings sheets, Flooring Tiles-types, Glass, Aluminium sections, Bitumen, Industrial timber products-veneer, Ply wood, particle board, fibre board, batten board, block board, pre-laminated boards, laminates

Building Planning, drawings and Estimates

Principles of planning, orientation, Introduction to building rules and bye laws, Building area terms-f plinth area and carpet area, Scales, Plan, Elevation, sections, dimensioning,

construction notes, symbols for construction materials, Concept of Line plans, site plan and location plan

Units of measurements, Types of estimate- approximate and detailed

Branches of Civil Engineering

Basics of water resources engineering : Types of irrigation schemes, Types of Dams – Gravity dams and earth dams and their suitability, Bandhara

Basics of environmental engineering: Sources of water, Demand of water, Quality of water, waste water, Need of water treatment and waste water treatment

Basics of transportation engineering : Modes of Transportation - Roads, railways, bridges, tunnels and airports, docks and harbours , Typical cross sections of roads

Text Books:

1. Ramamrutham, Basic Civil Engineering, Dhanapatrai Publications, New Delhi, 2013
2. Bhavikatti S. S., Basic Civil Engineering, New Age Publication, 2010
3. Gopi S., Basic Civil Engineering, Pearson Education India, 2009
4. B. C. Punmia & Ashok Kumar Jain, Basic of Civil Engineering, Firewall Media, 2003

Reference Books and website links:

1. S.C. Rangwala, Engineering Materials, Charotar Publications, 2008
2. S.C. Rangwala, Engineering Materials, Charotar Publications
3. C. P. Kaushik, Basic of Civil and Environmental Engineering, , New Age Publication
4. M.S. Palanichamy, Basic Civil Engineering, McGraw Hill

Course Outcomes:

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

CE1223.1	Describe importance of Civil Engineering and role of Civil Engineer in infrastructure development
CE1223.2	Explain various types of investigations required for Civil Engineering projects
CE1223.3	Describe various building materials and their use/ application in Civil Engineering Constructions
CE1223.4	Explain basics of Civil engineering Planning, drawings and Estimates
CE1223.5	Describe various details related to branches of Civil Engineering

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1223.1	0	0	0	0	0	1	0	0	0	2	0	1	2	3	1
CE1223.2	0	0	0	0	0	1	0	0	0	2	0	1	2	3	1
CE1223.3	0	0	0	0	0	1	0	0	0	2	0	1	2	3	1
CE1223.4	0	0	0	0	0	1	0	0	0	2	0	1	2	3	1
CE1223.5	0	0	0	0	0	1	0	0	0	2	0	1	2	3	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	CE1211	Course category	EX1
Course Name	**Civil Engineering Survey**		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	-	-	-	-	-	-	-	50	-	50	04

Course Objectives:
To make the students aware and understand:

1. Traversing process using prismatic compass and theodolite
2. Plane table surveying
3. Measurement of area using plannimeter
4. Levelling process using auto level and digital level
5. Use of total station for measuring angles and distances

Course Contents:

It is a representative list of practical/exercises. The instructor may choose experiments to fulfil the course outcomes.

List of Practicals:

1. Chain and compass traversing along with noting the details in field book and plotting on full imperial size sheet
2. Plane table surveying for survey of a given area and plotting of features of ground on full imperial size sheet
3. Theodolite traversing, preparing Gales Traverse Table and plotting of features of ground on A1 size sheet
4. Profile levelling using auto level / Digital level for minimum 1000 m length, entering reading in field book, making calculations, applying checks, and plotting of L-section & cross sections of road on A1 size sheet.
5. Block contouring using auto level / Digital level for minimum 500 x 500 m area and Plotting of contour map on A1 size sheet
6. Total station traversing, preparing Gales Traverse Table and plotting of features of ground on A1 size sheet
7. Measurement of area by plannimeter

Practical Assessment:

ICA: The Internal Continuous Assessment shall be based on timely submission of practical record and knowledge /skill acquired. The performance shall be assessed using continuous assessment formats.

Course Outcomes:

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

CE1211.1 Carry out traversing by chain and compass, Theodolite and Total station, enter the readings in field book, make calculation and plot the plan

CE1211.2 Carry out plane table surveying

CE1211.3 Carry out various types of levelling, enter the reading in levelling books, make calculations, plot the L- section, cross sections and contours

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1211.1	2	3	0	3	3	1	0	0	2	1	0	1	2	3	3
CE1211.2	2	3	0	3	3	1	0	0	2	1	0	1	2	3	3
CE1211.3	2	3	0	3	3	1	0	0	2	1	0	1	2	3	3

Course Code	CE1212	Course category	EX1
Course Name	**Testing of Civil Engineering Materials**		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	-	-	-	-	-	-	-	50	-	50	04

Course Objectives:
To make the students aware and understand:

1. Experimental procedures as per relevant IS / IRC codes to determine properties of course aggregates and bitumen and determine their suitability for road construction
2. Experimental procedures as per relevant IS codes to determine properties of cement and concrete and steel and determine their suitability for construction
3. Experimental procedures as per relevant IS codes to determine properties of soils and determine their suitability for construction

Course Contents:

List of Practicals:

Any four groups from following

1. **To determine the suitability of Aggregate for Road construction by conducting the following test:**
   i. Crushing Value test,
   ii. Los Angeles abrasion test,
   iii. Aggregate impact test,
   iv. Aggregate shape test - Flakiness index and elongation index determination.
   v. Determination of specific Gravity of coarse Aggregates

2. **To determine the suitability of Bitumen for Road construction by conducting the following tests**:
   i. Determination of Bitumen Content by Centrifuge Extractor
   ii. Penetration test,
   iii. Ductility test,
   iv. Viscosity test,
   v. Softening point test,

3. **To determine the suitability of cement for construction by conducting the following tests**:
   i. Fineness test on cement
   ii. Soundness test on cement
   iii. Standard consistency of cement
   iv. Setting time (initial and final) of cement
   v. compressive strength of cement ,

4. **To determine the suitability of cement concrete for construction by conducting the following tests**:
   i. Workability tests i.e. slump test and compaction factor test,
   ii. Compressive strength and flexural strength of concrete,

5. **To determine the suitability of steel reinforcement construction by conducting the following tests**:
   i. Weight per meter of steel bars
   ii. Tensile tests on various grades of steel

6. **To determine the suitability of soil for construction by conducting the following tests**:
   i. Classification of coarse grained soil by conducting sieve analysis
   ii. Classification of fine grained soil by conducting liquid limit and plastic limit tests
   iii. Determination of OMC and MDD by conducting standard Proctor test,
   iv. Determination of CBR value,
   v. Determination of permeability
   vi. Determination of shear strength parameters by conducting UCS and direct shear test

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge/ skill acquired. The performance shall be assessed experiment wise using continuous assessment.

Course Outcomes:

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

CE1212.1: Conduct the experiments using standard experimental procedure as per IS / IRC on aggregates and bitumen

CE1212.2: Conduct the experiments using standard experimental procedure as per IS on cement, concrete and steel reinforcement

CE1212.3: Conduct the experiments using standard experimental procedure as per IS on soil

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CE1212.1	2	3	0	1	3	1	0	0	2	1	0	1	2	3	0
CE1212.2	2	3	0	1	3	1	0	0	2	1	0	1	2	3	0
CE1212.3	2	3	0	1	3	1	0	0	2	1	0	1	2	3	0

Curriculum Structure for B. Tech. Mechanical Engineering Programme

(In light of NEP 2020)

NCrF Level 6

(NEP_Version II)

For students admitted in 2023-24 onwards

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

Near Kathora Naka, Amravati, Maharashtra
PIN 444604
www.gcoea.ac.in

Structure for B. Tech. Programme in light of NEP 2020

For students admitted in 2023-24 onwards

Key Features of Curriculum

1. Multiple entry and exit option after every year.
2. Provision for Open Electives (OE), Vocational and Skill Enhancement Courses (VSE), Ability Enhancement Courses (AE), Indian Knowledge System (IKS), Value Education Courses (VE), Co-Curricular Courses (CC) in addition to program core courses.
3. Mandatory internship of one semester.
4. Credits for Value education courses, Ability Enhancement Courses, Co-Curricular Curricular Activities.
5. Mandatory Non-Credit Courses.
6. Interdisciplinary and multidisciplinary education through single and double minors and open electives.
7. Skill based courses and multiple exit level.
8. Provision for learning in online mode through Swayam/ NPTEL etc courses
9. Provision for B.Tech. Honours with Research degree through research project.
10. Opportunity for learner to choose courses of their interest in all disciplines.
11. Provision of Skill Based Courses and internship/Field project/mini projects for exit options at each level.
12. Flexibility for all types of learners i.e. Good, Normal and Exit

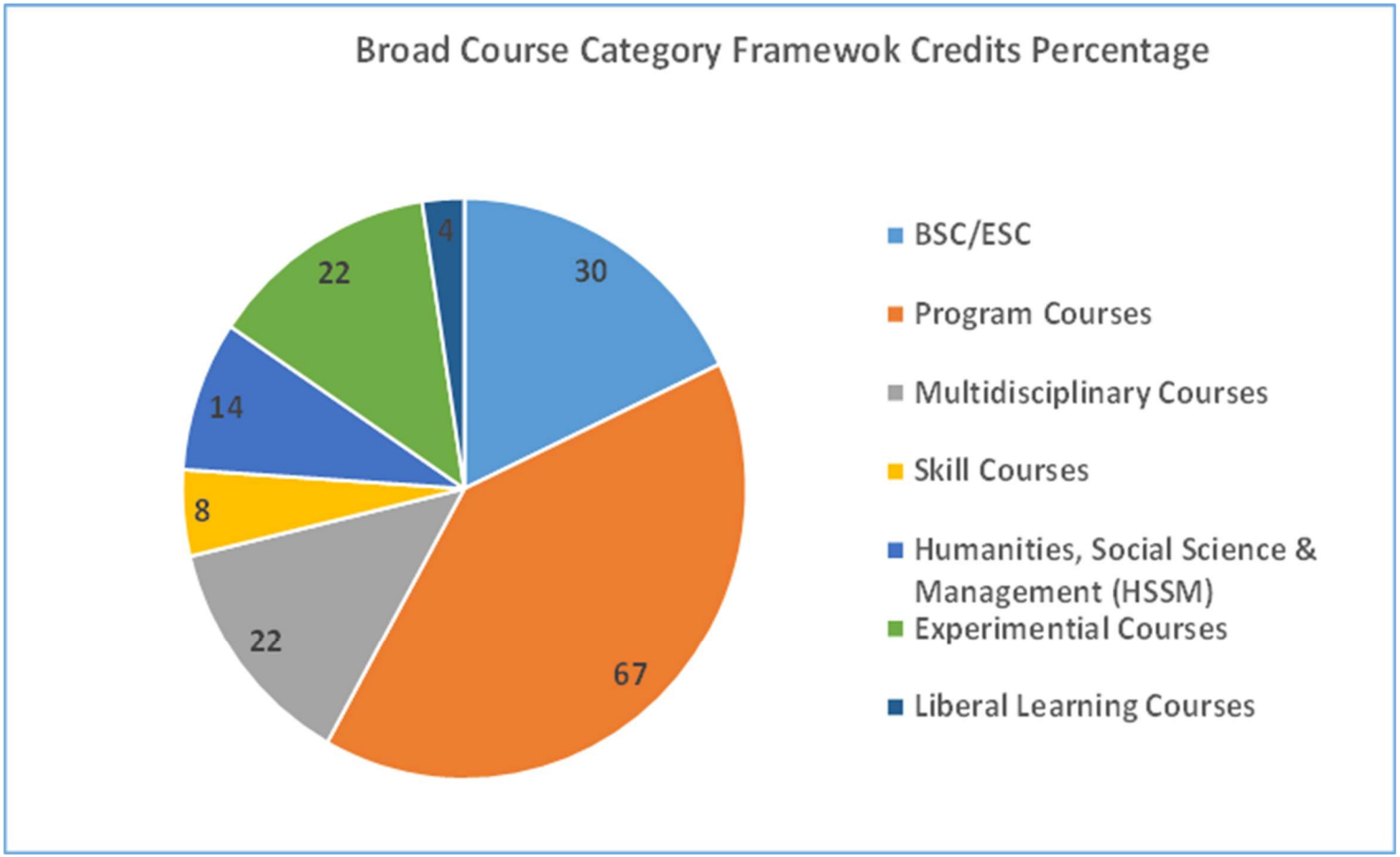
Good Students	Normal Students	Exit
B. Tech. Major with Multidisciplinary Minor	B. Tech. Major with Multidisciplinary Minor	Additional 08 credits in the form of skill-based courses / labs, internship, mini projects shall be offered in 8 weeks.
B. Tech. Honors and Multidisciplinary Minor	--	
B. Tech. Honors with Research and Multidisciplinary Minor	--	
B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	--	

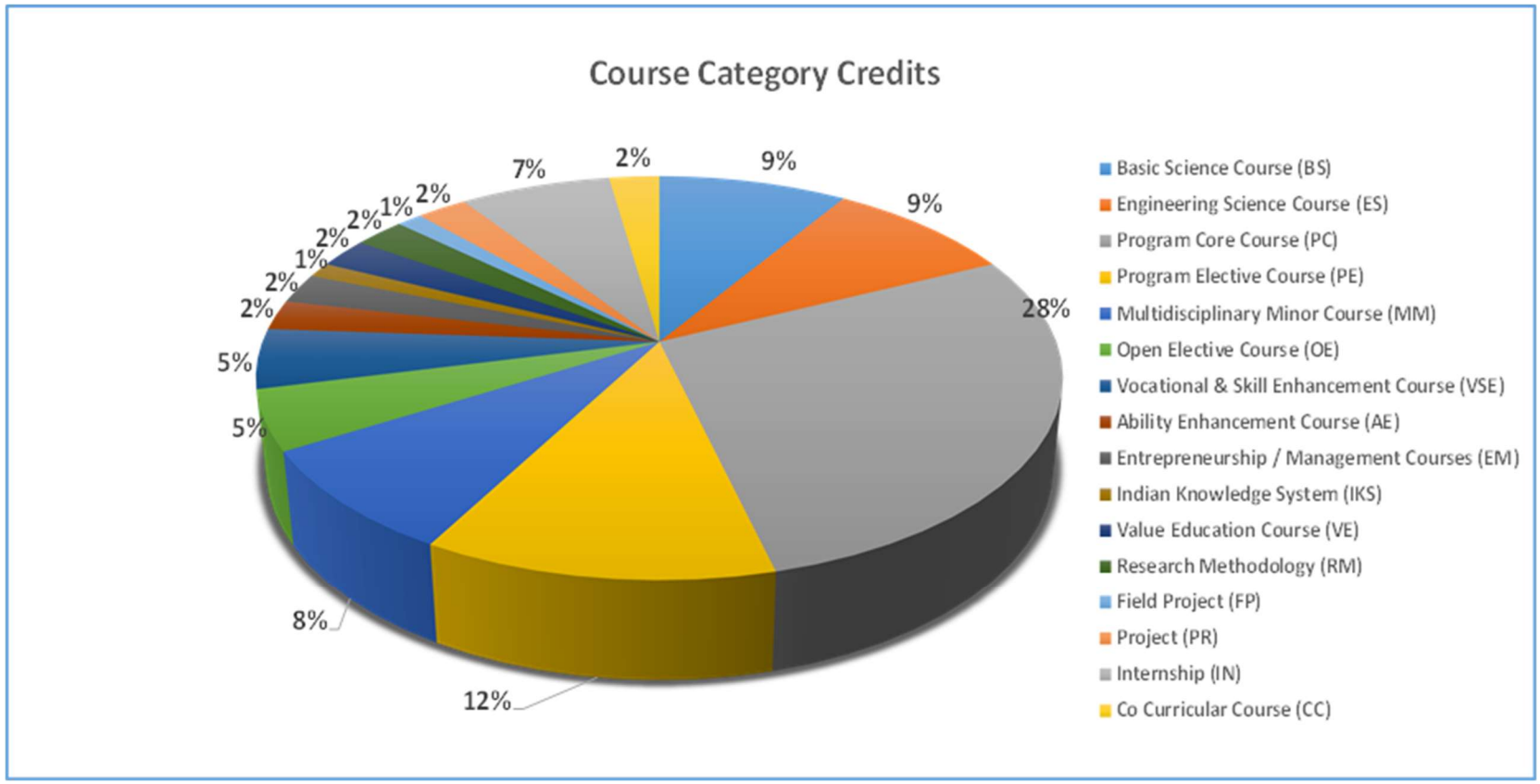
Credit Distribution for each year and Exit Option

NCrFLevel	Year / Semester	Exit Option	Credits	Additional Credits for exit students	Total Credits
4.5	Semester I & II	U. G. Certificate	43	08	51
5.0	Semester III & IV	U. G. Diploma	84	08	92
5.5	Semester V & VI	B. Vocational/B.Sc. Engg.	127	08	135
6.0	Semester VII & VIII	B. Tech.Major with Multidisciplinary Minor	167	--	167
		B. Tech. Honors and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. Honors with Research and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	167+18=185	--	185

Course Category-wise Credit Distribution

Course Category	As per NEP GR	GCOEA Credits	CC	As per NEP GR	GCOEA Credits
BSC/ESC	30	30	BS	14-18	12
			ES	16--12	18
Program Courses	64-76	67	PC	44-56	47
			PE	20	20
Multidisciplinary Courses	22	22	MM	14	14
			OE	8	8
Skill Courses	8	8	VSE	8	8
Humanities, Social Science & Management (HSSM)	14	14	AE	4	4
			EM	4	4
			IKS	2	2
			VE	4	4
Experiential Courses	22	22	RM	4	4
			FP	2	2
			PR	4	4
			IN/OJT	12	12
Liberal Learning Courses	4	4	CC	4	4
Total Credits	**160-176**	**167**		**160-176**	**167**


Broad Course Category Framewok Credits Percentage
30
67
22
8
14
22
4
BSC/ESC
Program Courses
Multidisciplinary Courses
Skill Courses
Humanities, Social Science & Management (HSSM)
Experimental Courses
Liberal Learning Courses


Course Category Credits
9%
9%
28%
12%
8%
5%
5%
2%
2%
1%
2%
2%
1%
2%
7%
2%
Basic Science Course (BS)
Engineering Science Course (ES)
Program Core Course (PC)
Program Elective Course (PE)
Multidisciplinary Minor Course (MM)
Open Elective Course (OE)
Vocational & Skill Enhancement Course (VSE)
Ability Enhancement Course (AE)
Entrepreneurship / Management Courses (EM)
Indian Knowledge System (IKS)
Value Education Course (VE)
Research Methodology (RM)
Field Project (FP)
Project (PR)
Internship (IN)
Co Curricular Course (CC)

Semester-wise Credit Distribution

Sr. No.	SEM	I	II	III	IV	V	VI	VII	VIII	Total Credits	NEP Requirement
1	Basic Science Course (BS)	8	7	3						18	14-18
2	Engineering Science Course (ES)	8	4							12	12-16
3	Program Core Course (PC)		6	11	12	9	6	3		47	44-56
4	Program Elective Course (PE)					4	8	8		20	20
5	Multidisciplinary Minor Course (MM)			3	3	3	3	2		14	14
6	Open Elective Course (OE)				3	3		2		8	8
7	Vocational & Skill Enhancement Course (VSE)			2	1	2	1	2		8	8
8	Ability Enhancement Course (AE)	1	3							4	4
9	Entrepreneurship / Management Courses (EM)			1					3	4	4
10	Indian Knowledge System (IKS)	2								2	2
11	Value Education Course (VE)	2	2							4	4
12	Research Methodology (RM)								4	4	4
13	Field Project (FP)						2			2	2
14	Project (PR)							4		4	4
15	Internship (IN)								12	12	12
16	Co Curricular Course (CC)				2	2				4	4
	Total Credits	**21**	**22**	**20**	**21**	**23**	**20**	**21**	**19**	**167**	160-176

General Instructions:

(1) 10% content of syllabus of each theory course shall be completed by the students with self-study. The 10% portion of each course (for self-study) shall be declared by the concerned course-coordinator at the beginning of teaching of the course.

(2) Student can complete **any Course** or programme elective courses PE1 to PE5 in "online" mode, offered through SWAYAM/ NPTEL portal or equivalent platform which provides Evaluation mechanism with the permission of Departmental Faculty Board (DFB). In this case –

(i) Students can register and complete these online courses any time after beginning of third semester, however, the student must successfully complete and pass the course, and submit the score card/certificate before declaration of result of respective semester in which the course is being offered.

(ii) In case, if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute in respective semester as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the course, and successfully complete the course.

(3) In eighth semester, the students have to complete mandatory internship of one semester in the company/ organization approved by the DFB.

(4) In eighth semester during internship, the students have to complete the theory courses in any one of the two modes:

(i) **Online courses** offered through SWAYAM/ NPTEL or equivalent platform which provides Evaluation mechanism with the permission of DFB: In this case, students can register and complete these online courses any time after beginning of third semester and complete the course and submit the score card/ certificate before declaration of result of eighth semester.

In case if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the course personally as per the schedule declared by the institute, and successfully complete the course.

(ii) **Self-study mode:** In this case the student will have to study the course offered by the institute of his/her own. The student shall appear for all the college assessments/ examinations (CT1/CT2, TA and ESE) personally as per the schedule declared by the institute and successfully complete the course.

(5) In addition to program specific courses, the students have to complete vocational skill courses, internship, field projects connected to **major degree**.

(6) Exit Option:

The exit option at the end of each year will be available to students after even semester. e. 2nd semester, 4th semester &6th semester and will commence from AY 2024-25 for UG Certificate, AY 2025-26 for UG Diploma, AY 2026-27 for B. Voc./B. Sc. Engineering degree.

(7) Students opting for exit at any level (after odd semesters or even semester) will have to earn additional eight credits before exit in skill based vocational courses and internship/apprenticeship/mini project to make them eligible to get UG certificate / UG Diploma or B. Voc./B. Sc. Engineering degree as per eligibility.

(8) Re Entry and Lateral Entry: Students opting for exit at any level after even semester, will have the option to re-enter the programme from where they left off in odd semesters within **four years of exit.** There shall be a gap of at least **one year** between exit and re-entry to UG programme.

(9) Students opting for exit after odd semester, i.e. 1st, 3rd, 5th or 7th semester will have the option to re-enter the programme from where they left off in even semesters only. There shall be a gap of at least **one year** between exit and re-entry to UG programme.

(10) Maximum period for completion of B. Tech. programme:

The student has to complete the degree programme within the stipulated **maximum period of eight years** from the date of admission to first year UG. The maximum duration of the programme includes the period of exit, withdrawal, absence and different kinds of leaves permissible to a student but it shall exclude the period of rustication of the student from the institute. However, genuine cases on confirmation of valid reasons may be referred to Academic Council for extending this limit by **additional one year**.

(11) Eligibility for admission to the UG Bachelor's Degree with Honours/ Research/Double Minor:

Students with minimum **CGPA of 7.5** without backlog courses at the end of fourth semester and should have earned 84 **credits** are eligible for admission to the UG Bachelor's Degree with Honours/ Research/ Double Minor.

SEMESTER –I														
Category	**Course Code**	**Name of the Course**	**Teaching Scheme**				**Evaluation Scheme**							**Credits**
							Theory				**Practical**		**Total**	
		Induction Program	TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
BS1	SH1121	Engineering Mathematics-I	3	1		4	15	15	10	60			100	4
BS2	SH1122	Engineering Physics	3			3	15	15	10	60			100	3
	SH1123	Engineering Physics Laboratory			2	2					25		25	1
ES1	EE1121	Basic Electrical Engineering	3			3	15	15	10	60			100	3
	EE1122	Basic Electrical Engineering Laboratory			2	2					25		25	1
ES2	CS1121	Programming for Problem Solving	2			2	15	15	10	60			100	2
	CS1122	Programming for Problem Solving Laboratory			2	2					25		25	1
ES3	ME1121	Workshop Practices			2	2					25		25	1
AE1	SH1124	Communication Skill			2	2	0	0			50		50	1
VE1	SH1125	Environment Science	2			2	15	15	20				50	2
IKS1	SH1126	Indian Knowledge System	2			2			40				40	2
Total			**15**	**1**	**10**	**26**	**75**	**75**	**100**	**240**	**150**		**640**	**21**

SEMESTER –II														
Category	**Course Code**	**Name of the Course**	**Teaching Scheme**				**Evaluation Scheme**							**Credits**
							Theory				**Practical**		**Total**	
			TH	TU	PR	Total	CT-1	CT-2	TA	ESE	ICA	ESE		
BS3	SH1221	Engineering Mathematics-II	3	1		3	15	15	10	60			100	4
BS4	SH1222	Engineering Chemistry	2			2	15	15	10	60			100	2
	SH1223	Engineering Chemistry Laboratory			2	2					25		25	1
ES4	ME1221	Engineering Graphics	2			2	15	15	10	60			100	2
	ME1222	Engineering Graphics Lab			2	2					25		25	1
PC1	CE1221	Engineering Mechanics	3			3	15	15	10	60			100	3
ES5	CE1222	Engineering Mechanics Lab			2	2					25		25	1
PC2	ME1223	Mechanical Measurement	3			3	15	15	10	60			100	3
AE2	SH1224	Modern Indian Language		2		2	15	15	20				50	2
VE2	SH1225	Universal Human Value	2			2	15	15	20				50	2
MNC1	SH1226	Yoga &Fitness			2	2			20				20	0
AE3	SH1227	Language Laboratory			2	2					25		25	1
			15	**3**	**10**	**27**	**105**	**105**	**110**	**300**	**100**		**720**	**22**

Note : In first semester , the students of Civil, Electrical, Electronics & Telecommunication ,Instrumentation Engineering programmes will be offered the courses mentioned under Semester-I **AND** students of Mechanical , Computer Science Engineering and Information Technology will be offered the courses mentioned under Semester-II and in Second Semester Vice-versa except Engineering Mathematics-I (SH1101) and Engineering Mathematics-II (SH1201).

Equivalence Scheme

Programme Name:-B. Tech. Mechanical

Couse code with name of course (old)						Couse code with name of course (New)		
Revised curriculum 2019 -2020			**NEP Version 1**			**NEP Version 2**		
Code	**Name**	**Credit**	**Code**	**Name**	**Credit**	**Code**	**Name**	Credit
MEU 121	Workshop Practice-I	1	ME1102	Workshop Practice	1	ME1121	Workshop practices	1
MEU 221	Engineering Graphics	2	ME1101	Engineering Graphics	2	ME1221	Engineering Graphics	2
MEU 222	Basic Mechanical Engineering	2	---	----No Equivalence---	3	---		
MEU 223	Engineering Graphics Lab	2	ME1103	Engineering Graphics Laboratory	1	ME1222	Engineering Graphics Lab	1
MEU 224	Workshop Practice- II	1	---	----No Equivalence--	-		----No Equivalence--	
			ME1215	Basic Mechanical Engineering	3	**---**	----No Equivalence---	
						ME1223	Mechanical Measurement	3

Multiple exits: Following options are available for multiple exists:

Option	NCrF Level	Qualification Title	Additional credit requirement	Bridge courses
Exit-1	4.5	One year UG certificate course in Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at ITI Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project
Exit-2	5.0	Two year UG Diploma I Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at Diploma Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project
Exit-3	5.5	Three year Bachelor Degree in Vocation (B.Voc) orB.Sc. (Engg./Tech)	8	2 Month Internship **OR** Online Two skill courses at Degree Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project

EXIT CRITERIA FOR U. G. CERTIFICATE (Duration 8 Weeks)														
Category	**Course Code**	**Name of the Course**	**Teaching Scheme**				**Evaluation Scheme**						**Credits**
							Theory			**Practical**		**Total**	
			Theory Hrs /week	**Tutorial Hrs/week**	**Practical Hrs/week**	**Total**	**MSE**	**TA**	**ESE**	**ICA**	**ESE**		
EX1	ME1211	Apprenticeship / Internship of minimum eight weeks (with three reviews)								50		50	3
EX2	ME1212	Workshop Technology					30	20				50	3
EX3	ME1213	3 D Modelling Laboratory								50		50	2
	Total						30	20		**100**		**150**	8

@ Based on seminar, Internship Report, Internship/ Project evaluation

	ME1223							Course category			ESA
Course Name	MECHANICAL MEASUREMENT										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2 hrs 30 min	00	00	100	03

Course Objectives:

To make the students aware and understand:

1. About general performance characteristics of measuring instruments.
2. strain gauges and their working principle
3. working of force, torque and flow measuring instrument
4. Temperature measuring devices
5. Speed and liquid level measuring devices.

Course Contents:

Generalized Measurement system: Significance of measurement, generalized systems, applications of measuring instruments. Types of measuring instruments. General configuration and functional elements of measuring instruments, types of inputs various methods of correction for interfering and modifying inputs. Static characteristics, Dynamic characteristics, Introductions to Strain Gauges, working principle.

Pressure Measurements: Basic methods of pressure measurement, strain gauge pressure cell, High pressure measurement Bridgeman type, low pressure Measurement – Mcloed, Knudsen, ionisation.

Force and Torque Measurement: working principle, Various mechanical, Hydraulic, pneumatic and electrical methods.

Flow Measurements: orifice meter, Rotameter, pitot flow meter and turbine meter, electro-magnetic flow meter.

Temperature Measurements: Standards, Various temperature measuring devices, bimetallic strip, pressure thermometers, thermo couples, electrical resistance thermometers, Thermistors, radiation Thermometers.

Liquid Level Measurement: Various Methods such as single float, displacement or force transducers. Pressure sensitivity, bubbler or page system, capacitance variation type (for both conducting and non-conductive type liquids) Resistance Variation type.

Speed Measurements: Various mechanical type tachometers, electrical types tachometers, stroboscope etc.

Text Books:

1. Measurement Systems:- By Erenest O. Doebelins - MC Graw Hill.
2. Mechanical Measurement & Control: By D.S. Kumar.

Sign
Member Secretary

Sign
BoS Chairperson

Sign
Dean (Academics)

Sign
Principal

Reference Books:

1. Mechanical Measurements:- By T.G. Beckwith & N.L. Bulk-Addison Werllv.

2. Instrumental Measurement & Analysis: By Nakra Choudhari Tata Mc Graw Hill.

3. Mechanical Measurement & Instrumentation: By R.K. Rajput, Katsons Books Publications.

Course Outcomes: On completion of the course, students will be able to:

ME1223. 1 Analyze different measurement systems.

ME1223. 2 Calculate different types of errors in the measurement system.

ME1223. 3 Use strain gauges and pressure measurement devices for several applications.

ME1223. 4 Compare different methods of force, and Torque flow measurement methods.

ME1223. 5 Select appropriate liquid level and temperature measurement devices for given applications

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1223. 1	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
ME1223. 2	2	3	1	2	--	-	-	-	-	-	-	-	3	-	-
ME1223. 3	3	2	1	2	--	-	-	-	-	-	-	-	2	-	-
ME1223.4	3	2	1	-	-	-	1	-	-	-	-	-	3	-	-
ME1223. 5	2	1	1	-	-	-	-	-	-	-	-	-	2	-	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Curriculum Structure for B. Tech. Electronics and Telecommunication Engineering Programme

(In light of NEP 2020)

NCrF Level 6

(NEP_Version II)

For students admitted in 2023-24 onwards

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

Near Kathora Naka, Amravati, Maharashtra
PIN 444604

www.gcoea.ac.in

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Structure for B. Tech. Programme in light of NEP 2020

For students admitted in 2023-24 onwards

Key Features of Curriculum

1. Multiple entry and exit option after every year.
2. Provision for Open Electives (OE), Vocational and Skill Enhancement Courses (VSE), Ability Enhancement Courses (AE), Indian Knowledge System (IKS), Value Education Courses (VE), Co-Curricular Courses (CC) in addition to program core courses.
3. Mandatory internship of one semester.
4. Credits for Value education courses, Ability Enhancement Courses, Co-Curricular Curricular Activities.
5. Mandatory Non-Credit Courses.
6. Interdisciplinary and multidisciplinary education through single and double minors and open electives.
7. Skill based courses and multiple exit level.
8. Provision for learning in online mode through Swayam/ NPTEL etc courses
9. Provision for B.Tech. Honours with Research degree through research project.
10. Opportunity for learner to choose courses of their interest in all disciplines.
11. Provision of Skill Based Courses and internship/Field project/mini projects for exit options at each level.
12. Flexibility for all types of learners i.e. Good, Normal and Exit

Good Students	Normal Students	Exit
B. Tech. Major with Multidisciplinary Minor	B. Tech. Major with Multidisciplinary Minor	Additional 08 credits in the form of skill-based courses / labs, internship, mini projects shall be offered in 8 weeks.
B. Tech. Honors and Multidisciplinary Minor	--	
B. Tech. Honors with Research and Multidisciplinary Minor	--	
B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	--	

Credit Distribution for each year and Exit Option

NCrFLevel	Year / Semester	Exit Option	Credits	Additional Credits for exit students	Total Credits
4.5	Semester I & II	U. G. Certificate	43	08	51
5.0	Semester III & IV	U. G. Diploma	84	08	92
5.5	Semester V & VI	B. Vocational/B.Sc. Engg.	127	08	135
6.0	Semester VII & VIII	B. Tech.Major with Multidisciplinary Minor	167	--	167
		B. Tech. Honors and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. Honors with Research and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	167+18=185	--	185

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Course Category-wise Credit Distribution

Course Category	As per NEP GR	GCOEA Credits	CC	As per NEP GR	GCOEA Credits
BSC/ESC	30	30	BS	14-18	15
			ES	16-12	15
Program Courses	64-76	67	PC	44-56	47
			PE	20	20
Multidisciplinary Courses	22	22	MM	14	14
			OE	8	8
Skill Courses	8	8	VSE	8	8
Humanities, Social Science & Management (HSSM)	14	14	AE	4	4
			EM	4	4
			IKS	2	2
			VE	4	4
Experiential Courses	22	22	RM	4	4
			FP	2	2
			PR	4	4
			IN/OJT	12	12
Liberal Learning Courses	4	4	CC	4	4
Total Credits	**160-176**	**167**		**160-176**	**167**

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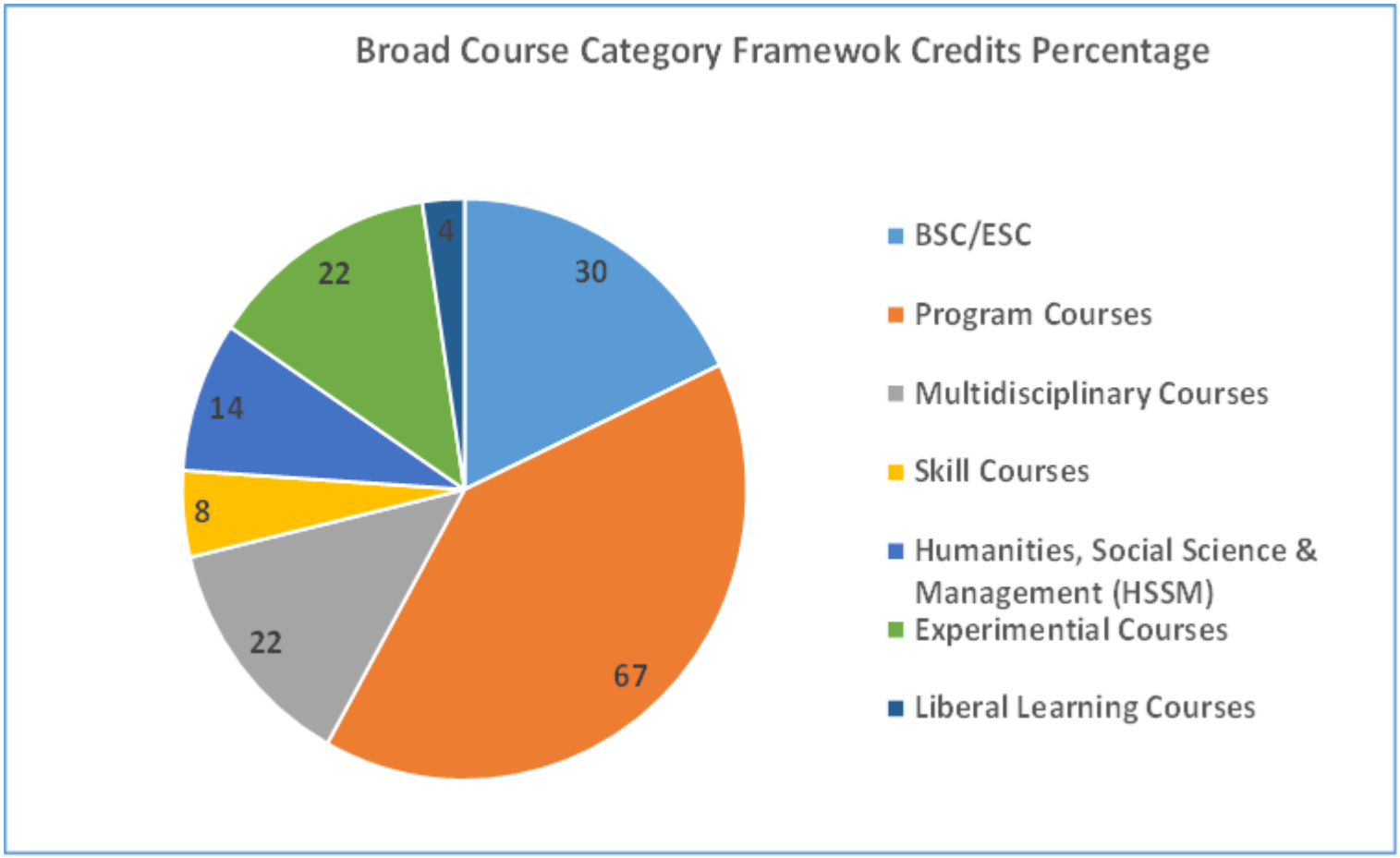
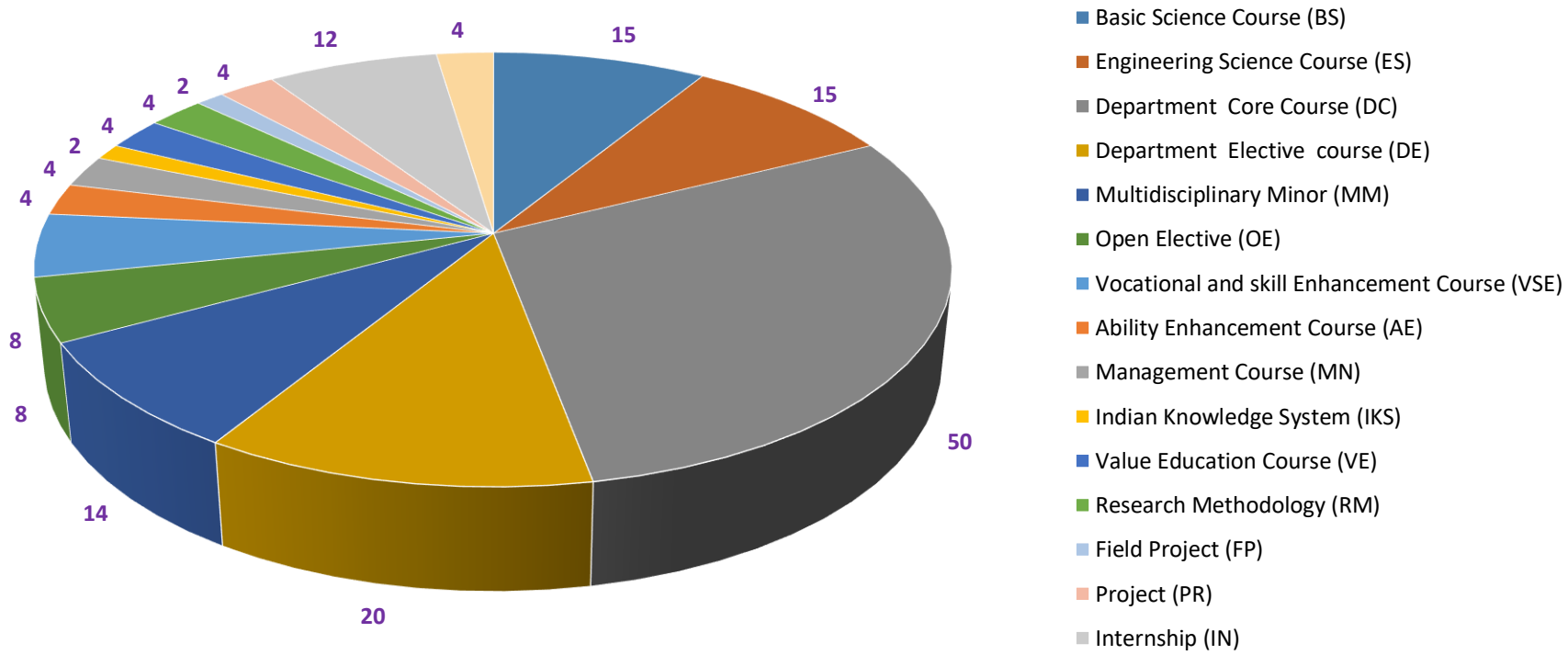

Broad Course Category Framewok Credits Percentage
30
67
22
8
14
22
4
BSC/ESC
Program Courses
Multidisciplinary Courses
Skill Courses
Humanities, Social Science & Management (HSSM)
Experimental Courses
Liberal Learning Courses

Course Category Credits



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Semester-wise Credit Distribution

Sr. No.	SEM	I	II	III	IV	V	VI	VII	VIII	Total Credits	NEP Requirement
1	Basic Science Course (BS)	8	7	3						18	14-18
2	Engineering Science Course (ES)	8	4							12	12-16
3	Program Core Course (PC)		6	10	14	8	6	3		47	44-56
4	Program Elective Course (PE)					5	8	7		20	20
5	Multidisciplinary Minor Course (MM)			3	3	3	3	2		14	14
6	Open Elective Course (OE)				3	3		2		8	8
7	Vocational & Skill Enhancement Course (VSE)			2	1	2	1	2		8	8
8	Ability Enhancement Course (AE)	1	3							4	4
9	Entrepreneurship / Management Courses (EM)			1					3	4	4
10	Indian Knowledge System (IKS)	2								2	2
11	Value Education Course (VE)	2	2							4	4
12	Research Methodology (RM)								4	4	4
13	Field Project (FP)						2			2	2
14	Project (PR)							4		4	4
15	Internship (IN)								12	12	12
16	Co Curricular Course (CC)				2	2				4	4
	Total Credits	**21**	**22**	**19**	**23**	**23**	**20**	**20**	**19**	**167**	**160-176**

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General Instructions:

(1) 10% content of syllabus of each theory course shall be completed by the students with self-study. The 10% portion of each course (for self-study) shall be declared by the concerned course-coordinator at the beginning of teaching of the course.

(2) Student can complete **any Course** or programme elective courses PE1 to PE5 in "online" mode, offered through SWAYAM/ NPTEL portal or equivalent platform which provides Evaluation mechanism with the permission of Departmental Faculty Board (DFB). In this case –

(i) Students can register and complete these online courses any time after beginning of third semester, however, the student must successfully complete and pass the course, and submit the score card/certificate before declaration of result of respective semester in which the course is being offered.

(ii) In case, if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute in respective semester as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the course, and successfully complete the course.

(3) In eighth semester, the students have to complete mandatory internship of one semester in the company/ organization approved by the DFB.

(4) In eighth semester during internship, the students have to complete the theory courses in any one of the two modes:

(i) **Online courses** offered through SWAYAM/ NPTEL or equivalent platform which provides Evaluation mechanism with the permission of DFB: In this case, students can register and complete these online courses any time after beginning of third semester and complete the course and submit the score card/ certificate before declaration of result of eighth semester.

In case if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the course personally as per the schedule declared by the institute, and successfully complete the course.

(ii) **Self-study mode:** In this case the student will have to study the course offered by the institute of his/her own. The student shall appear for all the college assessments/ examinations (CT1/CT2, TA and ESE) personally as per the schedule declared by the institute and successfully complete the course.

(5) In addition to program specific courses, the students have to complete vocational skill courses, internship, field projects connected to **major degree**.

(6) Exit Option:

The exit option at the end of each year will be available to students after even semester. e. 2nd semester, 4th semester &6th semester and will commence from AY 2024-25 for UG Certificate, AY 2025-26 for UG Diploma, AY 2026-27 for B. Voc./B. Sc. Engineering degree.

(7) Students opting for exit at any level (after odd semesters or even semester) will have to earn additional eight credits before exit in skill based vocational courses and internship/apprenticeship/mini project to make them eligible to get UG certificate / UG Diploma or B. Voc./B. Sc. Engineering degree as per eligibility.

(8) Re Entry and Lateral Entry: Students opting for exit at any level after even semester, will have the option to re-enter the programme from where they left off in odd semesters within **four years of exit.** There shall be a gap of at least **one year** between exit and re-entry to UG programme.

(9) Students opting for exit after odd semester, i.e. 1st, 3rd, 5th or 7th semester will have the option to re-enter the programme from where they left off in even semesters only. There shall be a gap of at least **one year** between exit and re-entry to UG programme.

(10) Maximum period for completion of B. Tech. programme:

The student has to complete the degree programme within the stipulated **maximum period of eight years** from the date of admission to first year UG. The maximum duration of the programme includes the period of exit, withdrawal, absence and different kinds of leaves permissible to a student but it shall exclude the period of rustication of the student from the institute. However, genuine cases on confirmation of valid reasons may be referred to Academic Council for extending this limit by **additional one year**.

(11) Eligibility for admission to the UG Bachelor's Degree with Honours/ Research/Double Minor:

Students with minimum **CGPA of 7.5** without backlog courses at the end of fourth semester and should have earned from 1 to 4 sem total mentioned credits are eligible for admission to the UG Bachelor's Degree with Honours/ Research/ Double Minor. Courses under this category must be completed in online mode through SWAYAM/ NPTEL or equivalent platform which provides evaluation mechanism. Credits/Marks Obtained under this category are directly mapped to mention teaching evaluation scheme. At the time of registration, if mention course is not available on SWAYAM/ NPTEL or equivalent platform , then DFB will provide available alternative/equivalent course.

SEMESTER –I														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
		Induction Program	TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
BS1	SH1121	Engineering Mathematics-I	3	1		4	15	15	10	60			100	4
BS2	SH1122	Engineering Physics	3			3	15	15	10	60			100	3
	SH1123	Engineering Physics Laboratory			2	2					25		25	1
ES1	EE1121	Basic Electrical Engineering	3			3	15	15	10	60			100	3
	EE1122	Basic Electrical Engineering Laboratory			2	2					25		25	1
ES2	CS1121	Programming for Problem Solving	2			2	15	15	10	60			100	2
	CS1122	Programming for Problem Solving Laboratory			2	2					25		25	1
ES3	ME1121	Workshop Practices			2	2					25		25	1
AE1	SH1124	Communication Skill			2	2					50		50	1
VE1	SH1125	Environment Science	2			2	15	15	20				50	2
IKS1	SH1126	Indian Knowledge System	2			2			40				40	2
Total			**15**	**1**	**10**	**26**	**75**	**75**	**100**	**240**	**150**		**640**	**21**

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SEMESTER –II

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT-1	CT-2	TA	ESE	ICA	ESE		
BS3	SH1221	Engineering Mathematics-II	3	1		4	15	15	10	60			100	4
BS4	SH1222	Engineering Chemistry	2			2	15	15	10	60			100	2
	SH1223	Engineering Chemistry Laboratory			2	2					25		25	1
ES4	ME1221	Engineering Graphics	2			2	15	15	10	60			100	2
	ME1222	Engineering Graphics Laboratory			2	2					25		25	1
PC	ET1221	Basic Electronics Engineering	3			3	15	15	10	60			100	3
ES	ET1222	Basic Electronics Engineering Laboratory			2	2					25		25	1
PC	ET1223	Electronics Communication	3			3	15	15	10	60			100	3
AE2	SH1224	Modern Indian Language		2		2	15	15	20				50	2
VE2	SH1225	Universal Human Value	2			2	15	15	20				50	2
MNC1	SH1226	Yoga &Fitness			2	2			20				20	0
AE3	SH1227	Language Laboratory			2	2					25		25	1
			15	**3**	**10**	**28**	**105**	**105**	**110**	**300**	**100**		**721**	**22**

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Note : In first semester , the students of Civil, Electrical, Electronics & Telecommunication ,Instrumentation Engineering programmes will be offered the courses mentioned under Semester-I **AND** students of Mechanical , Computer Science Engineering and Information Technology will be offered the courses mentioned under Semester-II and in Second Semester Vice-versa except Engineering Mathematics-I (SH1101) and Engineering Mathematics-II (SH1201).

Programme specific Subjects offered by programme wise

Sr No	Name of Programme	Programme specific Subject -1 aligned with Engineering Science Category XX1221-XX1222	Programme specific Subject -2 XX1223
1	Civil Engineering	Engineering Mechanics	Basic of Civil Engineering
2	Mechanical Engineering	Engineering Mechanics	Mechanical Measurement
3	Electrical Engineering	Analog and Digital Electronics	Energy Resource & Generation
4	Electronics & Telecommunication Engg	Basic Electronics Engineering	Electronics Communication
5	Computers Science & Engineering	Introduction to Computer Hardware and Networking	Computational Thinking with Python
6	Information Technology	Python Programming	Discrete Mathematics
7	Instrumentation Engineering	Elements of Measurement	Basic MatLab programming

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Equivalence Scheme

Programme Name:-B. Tech. Electronics & Telecommunication Engg

S N.	Course code with Name of course (old) Revised Curriculum 2019-20			NEP Version I			Course code with Name of course(NEW) (NEP Version-II)		
	Code	Name	Credit	Code	Name	Credit	Code	Name	Credit
1.	ETU221	Basic Electronics Engineering	2	ET1201	Basic Electronics Engineering	2	ET1221	Basic Electronics Engineering	3
2.		Newly Added			Newly Added		ET1222	Basic Electronics Engineering laboratory	1
3.		Newly Added		ET1215	Electronics Communication	3	ET1223	Electronics Communication	3
4.		Newly Added		ET1211	Apprenticeship / Internship	3	ET1213	Internship / Technical Project	8
5.		Newly Added		ET1212	Functional Electronics	3	ET1211	Assembly of Personal Computer	8
6.		Newly Added		ET1213	Electronics Laboratory	2	ET1212	Electronics Servicing & Maintenance	8 8

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Multiple exits: Following options are available for multiple exists:

Option	NCrF Level	Qualification Title	Additional credit requirement	Bridge courses
Exit-1	4.5	One year UG certificate course in Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at ITI Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project
Exit-2	5.0	Two year UG Diploma I Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at Diploma Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project
Exit-3	5.5	Three year Bachelor Degree in Vocation (B.Voc) orB.Sc. (Engg./Tech)	8	2 Month Internship **OR** Online Two skill courses at Degree Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project

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EXIT CRITERIA FOR U. G. Certificate														
Category	Course Code	Name of the Course @	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
EX1	ET1211	Assembly of Personal Computer	-	-	16	16	-	-	-	-	50	-	50	4
EX1	ET1212	Electronics Servicing & Maintenance	-	-	16	16	-	-	-	-	50	-	50	4
OR														
EX1	XX1213	**Internship / Technical Project**	-	-	16	16	-	-	-	-	100@	-	100	8

@ Based on seminar, Internship Report, Internship/ Project evaluation

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Course Code	ET1221							Course category			PC
Course Name	BASIC ELECTRONICS ENGINEERING										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30 min	-	-	-	03

Course Objectives: Students undergoing this course are expected to

1. understand semiconductor fundamentals, including materials and doping.
2. analyse diode characteristics and their current-voltage relationships.
3. explore various types of diodes and their applications in circuits.
4. comprehend the construction and operation of bipolar junction transistors (BJTs).
5. perform AC analysis of BJTs using appropriate models and configurations.

Course Contents:

Semiconductor Fundamentals: Overview of semiconductor materials: Ge, Si, GaAs, Covalent bonding and intrinsic materials. **Energy Levels and Doping:** Energy levels in semiconductors, n-type and p-type materials.

Semiconductor Diode, Characteristics and Equivalent Circuits: Semiconductor Diodes: Structure and operation of semiconductor diodes**,** Ideal versus practical diode characteristics. **VI Characteristics:** Current-voltage characteristics of diodes, Effect of temperature on diode performance. **Diode Equivalent Circuits**: Resistance levels in diodes, Transition and diffusion capacitance, Reverse recovery time.

Types of Diodes and Their Applications: Types of Diodes: Zener diodes: operation and applications**,** Light-emitting diodes (LEDs) and their characteristics. **Diode Circuit Analysis:** Load-line analysis, Half-wave and full-wave rectification, Clippers and clampers, Voltage regulation with diodes.

Introduction to Bipolar Junction Transistors (BJTs): BJT Construction and Operation: Transistor construction and basic operation**,** Common configurations: common-base, common-emitter, and common-collector. **Biasing Techniques:** Concept of operating point (Q-point)**. Biasing configurations:** fixed-bias, emitter-bias, voltage-divider bias, collector feedback, and emitter-follower configurations.

AC Analysis of Bipolar Junction Transistors: AC Amplification: Principles of amplification in the AC domain**,** BJT transistor modelling techniques. **Analysis of Common Configurations:** Common-emitter fixed-bias and voltage-divider configurations**,** Emitter-bias and emitter-follower configurations, Common-base configuration. **Advanced Analysis**

Techniques: Determining current gain in BJT circuits**,** Cascaded systems, Darlington connections, and feedback pairs.

Text Books:

1. Electronic Devices and Circuit Theory, Robert L. Boylestad and Louis. Nashelsky, 11th Edition, Pearson, 2015.
2. Millman's Electronic Devices and Circuits Third Edition Late Jacob Millman, Christos C Halkias, Satyabrata Jit Tata McGraw Hill Education Private Limited ,NEW DELHI 3/e, 2010

Reference Books:

1. Electronic Devices and Circuits by Dharma Raj Cheruku and Buttula Tirumala Krishna, Pearson Education 2/e 2008
2. Integrated devices & Circuits by Millman,Halkias & Jit TMH 2/e, 2008
3. Principles of Electronics, Albert Malvino and David Bates, 8th Edition, McGraw Hill, 2015.

Links:

1. https://www.nptelvideos.com/course.php?id=527 **Basic Electronics**: NPTEL Lecture Videos by **Prof. Chitralekha Mahanta, IIT Guwahati**. . (Lecture No.01 to 16)
2. https://nptel.ac.in/courses/122106025 **Basic Electronics and Lab**: NPTEL course by Prof. T.S. Natarajan, IIT Madras. (Lecture No.01 to 17)

Course Outcomes:

After Completion of Course, the student will able to

ET1221.1 demonstrate the ability to explain semiconductor principles.

ET1221.2 analyse and interpret diode characteristics and calculate relevant parameters.

ET1221.3 evaluate different types of diodes and apply load-line analysis in circuits.

ET1221.4 describe BJT operation in various configurations and apply biasing techniques.

ET1221.5 conduct AC analysis of BJT circuits and determine performance metrics.

CO-PO-PSO Mapping

CO	PO / PSO														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
ET1221.1	3	0	0	0	0	0	0	0	0	0	0	2	2	0	0
ET1221.2	3	1	0	0	0	0	0	0	0	0	0	2	2	0	0
ET1221.3	2	2	1	1	1	0	0	0	0	0	0	2	3	0	0
ET1221.4	1	2	1	1	2	2	0	0	0	0	0	3	3	0	0
ET1221.5	3	3	1	2	3	1	0	0	1	1	0	3	3	2	0

0- Not Correlated 1-Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

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Course Code	ET1222						Course category		ES
Course Name	ET1222BASIC ELECTRONICS ENGINEERING LABORATORY								
Teaching Scheme				Examination Scheme					Credits
Th	Tu	Pr	Total	Theory				Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	02	02	-	-	00	00	--	50	--	50	01

Course Objectives: Students undergoing this course are expected to

1. Work with Semiconductor based devices
2. Experience the behaviour of Semiconductor based devices in Circuits
3. Experiment with Diode, Transistor etc in circuits.
4. Realise Circuit applications using Diode and Transistor

Course Contents: Suggestive list but not limited to

1. Characteristics of pn junction diode
2. Characteristics of zener diode and zener as voltage regulator
3. Circuit using diode like half wave rectifier, full wave rectifier, bridge rectifier
4. Full wave rectifiers using l, c, l-section and π - section filters
5. Characteristics of zener junction diode
6. Transistor characteristics
7. Design self-bias circuit
8. Stability of q-point analysis
9. Input and output characteristics of transistor cb,cc and ce configuration
10. Various circuit of transistor using common base, common collector and common emitter
11. Transistor as as CE, CB and CC amplifier
12. Transistor as switch
13. Clippers and Clamper circuits

Course Outcomes:

After Completion of Course, the student will able to

ET1222.1 Use Testing and measuring Instrument by reading Manuals

ET1222.2 Choose and Use Semiconductor Devices like Diode and transistor Semiconductor by reading data sheets of the devices

ET1222.3 Realise the working of solid state diodes and transistors as switch and circuit component

ET1222.4 Implement Circuits using semiconductor devices and other Components.

ET1222.5 Build the circuits using Semiconductor Diode and Transistors to realise the importance of Semiconductor devices.

CO-PO-PSO Mapping

CO	PO / PSO														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
ET1222.1	3	0	0	1	0	0	0	0	0	0	0	2	2	0	0
ET1222.2	3	1	0	1	0	0	0	0	0	0	0	2	2	0	0
ET1222.3	2	2	1	2	1	0	0	0	0	0	0	2	3	0	0
ET1222.4	1	2	1	2	2	2	0	0	0	0	0	3	3	0	0
ET1222.5	3	3	2	3	3	1	0	0	1	1	0	3	3	2	0

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Course Code	ET1223							Course category		PC
Course Name	ELECTRONIC COMMUNICATION									
Teaching Scheme				Examination Scheme						Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	00	15	15	10	60	2 hrs 30 min	00	00	100	03

Course Objectives:

To make the student able

1. To introduce students with basics of communication system, modulation and demodulation.
2. To understand the concept of noise in communication
3. To understand fundamentals of wave propagation and radio communication
4. To expose the students to the ideas of Radio and Television broadcasting
5. To acquire knowledge of applications in communication such as Radar, Satellite and mobile

Course Contents:

Introduction to Electronic Communication: Elements of a communication system, need for modulation, Electromagnetic spectrum and typical applications.

Noise: External noise, Internal noise.

Modulation: Theory of Amplitude, Frequency, Phase Modulation, Demodulation: Concept.

Wave Propagation: Propagation of Waves

Radio Communication: AM and FM Radio transmitter and Receiver.

Television Broadcasting: Introduction to Television, Transmitter and Receiver, Direct-to-Home (DTH).

Radar Communication: Principle and fundamentals, Basic Pulsed Radar System.

Satellite communication: Satellite communication systems, Satellite orbits.

Mobile Communication: Cellular Mobile Communication.

Text Books:

1. Electronic Communication Systems, George Kennedy, Bernard Davis, McGraw Hill Publication, 5th edition, 2011.

Reference Books:

1. Satellite Communication, R. M. Gagliardi, 1 st edition, CBS publications and Distributors, 2004
2. Mobile Cellular Telecommunications, W. C.Y. Lee, 2nd edition, MGH, 2006

Course Outcomes:

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

ET1223.1 To introduce students with basics of communication system, modulation and demodulation.

ET1223.2 To describe concept of noise in communication

ET1223.3 To understand fundamentals of wave propagation

ET1223.4 Illustrate the knowledge of radio and television broadcasting

ET1223.5 Explicate various applications of communication

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ET1223.1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
ET1223.2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ET1223.3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ET1223.4	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
ET1223.5	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	ET1211							Course category		EX1
Course Name	ASSEMBLY OF PERSONAL COMPUTER									
Teaching Scheme				Examination Scheme						Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
--	--	08	08	--	--	--	--	--	50	--	50	04

Course Objectives:

To make student able

1. To explain the basic concepts of Peripheral devices
2. To understand the construction and working of Input &Output devices
3. To Know the Troubleshooting and preventive maintenance of PC .
4. To know law related issues in IT act.

Introduction: Understanding the basic of computer, its components, different I/O devices

Operating system: Acquiring skills to setup Computer BIOS, windows command prompt commands, formatting of Hard Disk, Installation of Operating System (Windows & Linux) and data recovery

Mother Board: Develop skills to identify different types of Mother Board, its components and configuring it.

Software Installation: Develop skills to install different types of application software, and Hard disk utility. Develop skills to perform preventive maintenance, running diagnostic tool, backup files, virus protection program

Printer: Develop skills to identify, configure and troubleshoot different types of Printers and UPS.

IT Act:, IT Act 2000/2008, Issues related to Digital signatures, Electronic records, Cybercrime and offenses , Interception and monitoring of electronic communications, Data protection and privacy

Text Book:

1. B. Govindarajalu, “IBM PC and Clones”, TMH Publication

Reference Books:

1. Mueller, “Repairing and Upgrading of IBM PC”, Que Publications
2. Mark Minasi, “The Complete PC Upgrade and Maintenance Guide”, BPB Publications.
3. D. Balasubramaniam, ”Computer Installation and Servicing”, TMH Publications.
4. Government of India IT Act 2000/2008

Useful Link:

National Institute of Electronics & Information Technology,Govt. of India.
https://nielit.gov.in/kohima/content/assembly-maintenance-personal-computer
https://bskillforum.bharatskills.gov.in/

Course Outcomes:

ET1211.1 Acquire skills to enter the BIOS setup utility and configuring the BIOS like Booting Sequence, system date, setting administrative password, USB Enabling

ET1211.2 Understand the use of different commands of Windows in command prompt

ET1211.3 Acquire knowledge and skills for Installation of Operating System for DOS & Windows Using Off-line and Online method and booting from pen drive

ET1211.4 Understand the various acts under IT Act 2000

ET1211.5 Understanding Printer interface and setting

CO-PO-PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ET1211.1	1	2	3	0	0	0	0	0	0	0	0	0	0	0	0
ET1211.2	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0
ET1211.3	3	1	2	0	0	0	0	0	0	0	0	0	0	0	0
ET1211.4	2	2	3	0	0	0	0	0	0	0	0	0	0	0	0
ET1211.5	2	2	3	0	0	0	0	0	0	0	0	0	0	0	0

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ET1212							Course category			EX1
Course Name	ELECTRONIC SERVICING &MAINTAINANCE										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
-	-	8	8	-	-	-	-	50	-	50	04

Course Objectives:

To make the students aware

1. The working of electronic products used in daily life
2. The repair and maintenance of these products
3. To Know the Troubleshooting and preventive maintenance of electronic products
4. To develop and acquire the skills of Calibration & Testing of Electronic Equipment.

Course Contents:

Digital Multimeter: Use of Digital Multimeter, Digital Multimeter range selection.

Resistors: Types of Resistors, Calculating the values of Color coded resistors.

DC voltage Measurement and DC voltage testing, Measuring AC voltage.

Introduction to Repair and troubleshooting electronics device.

Soldering techniques, ESD issues.

Basic Concepts of Repair & Maintenance, Use and acquire the skills of handling Lab Equipment – (DMM, CRO, Function generator etc) and Servicing of Consumer products.

Text Book:

EASY Laser Printer Maintenance & Repair By Stephen J. Bioelow

Reference Books:

1. Handbook of Repair & Maintenance of Domestic Electronics Appliances : Shashi Bhushan Sinha
2. Troubleshooting and Repairing Consumer Electronics Without a Schematic by Homer Davidson - Third Edition
3. S. P. Bali, Consumer Electronics, Pearson Education

Online Link:

1. 160513_RepairMaintenance_ElectProducts.pdf (nielit.gov.in)

2. Learn to Repair & Troubleshoot Electronics Device | Udemy

Course Outcomes:

At the end of the course, the students shall be able to

ET1212.1 to use the datasheets of components

ET1212.2 to identify the fault & repair

ET1212.3 to do maintenance of electronic products

ET1212.4 to do routine serving of consumer products

ET1212.5 understanding of working principles of electrical and mechanical components /systems in electronic gadgets

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ET1212.1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
ET1212.2	2	1	1	2	0	0	0	0	0	0	0	0	1	0	0
ET1212.3	2	1	1	2	0	0	0	0	0	0	0	0	1	0	0
ET1212.4	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
ET1212.5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	ET1213						Course category		EX1
Course Name	ET1213 INTERNSHIP / TECHNICAL PROJECT								
Teaching Scheme				Examination Scheme					Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	16	16	-	-	-	-	-	100	-	100	08

Course Objectives:

To make the students competent to:

1. Carry out industry internship / apprenticeship
2. Prepare report of industry internship / apprenticeship

Course Contents:

Industry internship / apprenticeship

Students must complete Internship/ / apprenticeship for a duration of minimum eight weeks, after completion of second semester of first year. The company/organization for Internship/ / apprenticeship must be approved by the DFB. All the official formalities to be completed by the student.

The students should undergo related trainings and perform tasks assigned to him in the Industry, under the guidance of Industry personnel. The students shall submit the report based on the Industry Internship / apprenticeship along with the Completion Certificate given by Industry.

Industry internship / apprenticeship may be carried out in any one of the following construction industry:

i) Central Government Department related to Electronics and Telecommunication Engineering e.g. BSNL, BHARAT ELECTRONICS etc.

ii) State Government Department related to Electronics and Telecommunication Engineering e.g. MSETC, Pune Maharashtra Power Grid Corporation of India Ltd (PGCIL)etc.

iii) Private Limited Company related to Electronics and Telecommunication Engineering AIRTEL MOBILES, SAMSUNG, VIDEOCON etc.

At the end of internship / apprenticeship, student should submit the report based on training received during internship / apprenticeship and also give presentation for the same to the panel of examiners / Evaluation Committee comprising of Experts appointed by the Program Head.

Course Outcome:

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

ET1213.1: Prepare report based on Industry internship / apprenticeship,

ET1213.2: Give presentation based on Industry internship / apprenticeship

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
ET1213.1	1	3	1	3	1	1	3	1	1	1	2	1	2	0	0
ET1213.2	1	3	1	3	1	1	3	1	1	1	2	1	2	0	0

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Curriculum Structure for B. Tech. Computer Science and Engineering Programme

(In light of NEP 2020)

NCrF Level 6

(NEP_Version II)

For students admitted in 2023-24 onwards

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

Near Kathora Naka, Amravati, Maharashtra
PIN 444604
www.gcoea.ac.in

Structure for B. Tech. Programme in light of NEP 2020

For students admitted in 2023-24 onwards

Key Features of Curriculum

1. Multiple entry and exit option after every year.
2. Provision for Open Electives (OE), Vocational and Skill Enhancement Courses (VSE), Ability Enhancement Courses (AE), Indian Knowledge System (IKS), Value Education Courses (VE), Co-Curricular Courses (CC) in addition to program core courses.
3. Mandatory internship of one semester.
4. Credits for Value education courses, Ability Enhancement Courses, Co-Curricular Curricular Activities.
5. Mandatory Non-Credit Courses.
6. Interdisciplinary and multidisciplinary education through single and double minors and open electives.
7. Skill based courses and multiple exit level.
8. Provision for learning in online mode through Swayam/ NPTEL etc courses
9. Provision for B.Tech. Honours with Research degree through research project.
10. Opportunity for learner to choose courses of their interest in all disciplines.
11. Provision of Skill Based Courses and internship/Field project/mini projects for exit options at each level.
12. Flexibility for all types of learners i.e. Good, Normal and Exit

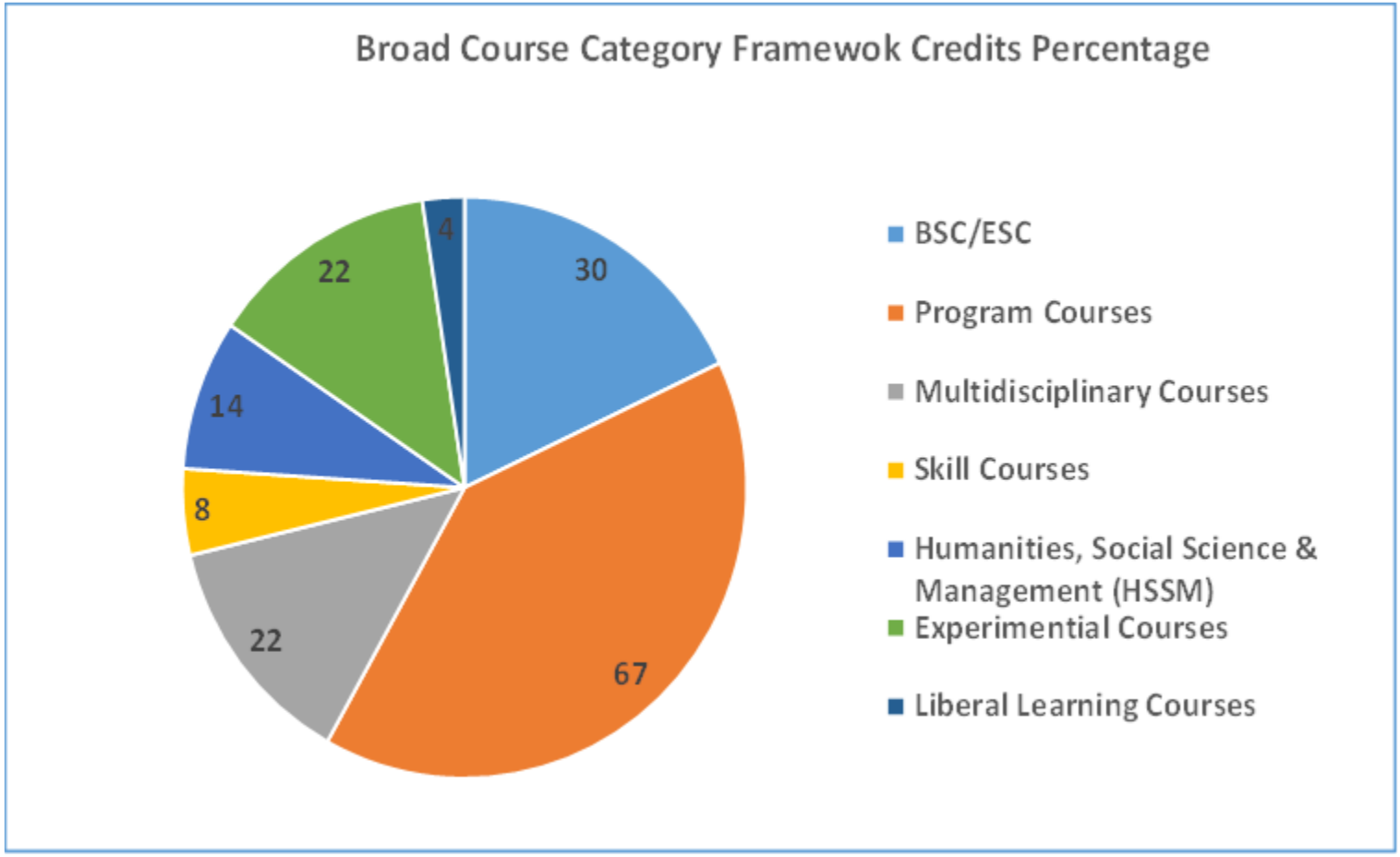
Good Students	Normal Students	Exit
B. Tech. Major with Multidisciplinary Minor	B. Tech. Major with Multidisciplinary Minor	Additional 08 credits in the form of skill-based courses / labs, internship, mini projects shall be offered in 8 weeks.
B. Tech. Honors and Multidisciplinary Minor	--	
B. Tech. Honors with Research and Multidisciplinary Minor	--	
B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	--	

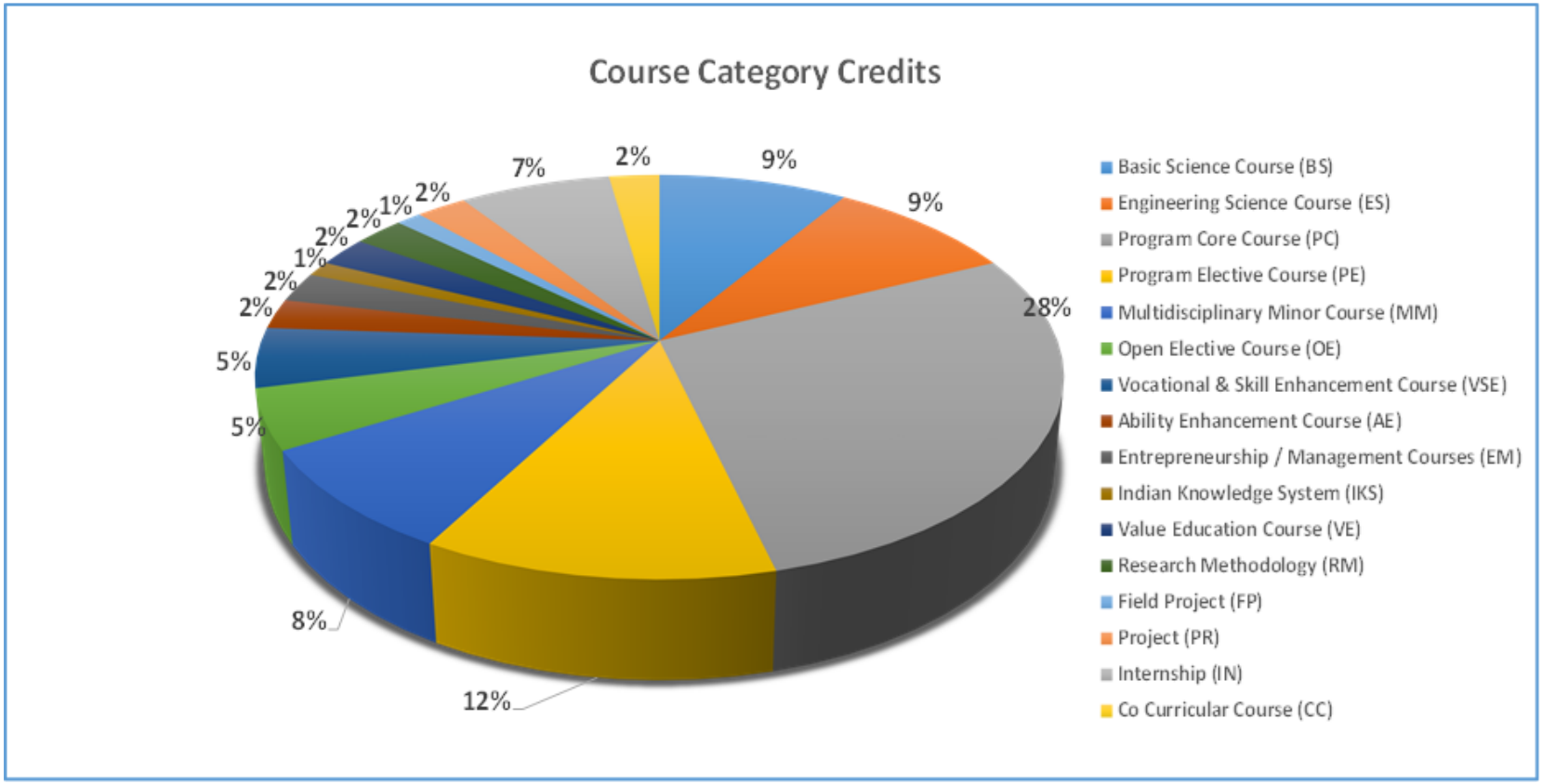
Credit Distribution for each year and Exit Option

NCrFLevel	Year / Semester	Exit Option	Credits	Additional Credits for exit students	Total Credits
4.5	Semester I & II	U. G. Certificate	43	08	51
5.0	Semester III & IV	U. G. Diploma	84	08	92
5.5	Semester V & VI	B. Vocational/B.Sc. Engg.	127	08	135
6.0	Semester VII & VIII	B. Tech.Major with Multidisciplinary Minor	167	--	167
		B. Tech. Honors and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. Honors with Research and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	167+18=185	--	185

Course Category-wise Credit Distribution

Course Category	As per NEP GR	GCOEA Credits	CC	As per NEP GR	GCOEA Credits
BSC/ESC	30	30	BS	14-18	18
			ES	16--12	12
Program Courses	64-76	67	PC	44-56	47
			PE	20	20
Multidisciplinary Courses	22	22	MM	14	14
			OE	8	8
Skill Courses	8	8	VSE	8	8
Humanities, Social Science & Management (HSSM)	14	14	AE	4	4
			EM	4	4
			IKS	2	2
			VE	4	4
Experiential Courses	22	22	RM	4	4
			FP	2	2
			PR	4	4
			IN/OJT	12	12
Liberal Learning Courses	4	4	CC	4	4
Total Credits	**160-176**	**167**		**160-176**	**167**


Broad Course Category Framewok Credits Percentage
30
67
22
8
14
22
4
BSC/ESC
Program Courses
Multidisciplinary Courses
Skill Courses
Humanities, Social Science & Management (HSSM)
Experimental Courses
Liberal Learning Courses



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Semester-wise Credit Distribution

Sr. No.	SEM	I	II	III	IV	V	VI	VII	VIII	Total Credits	NEP Requirement
1	Basic Science Course (BS)	8	7	3						18	14-18
2	Engineering Science Course (ES)	8	4							12	12-16
3	Program Core Course (PC)		6	14	12	9	6	3		47	44-56
4	Program Elective Course (PE)					4	8	8		20	20
5	Multidisciplinary Minor Course (MM)			3	3	3	3	2		14	14
6	Open Elective Course (OE)				3	3		2		8	8
7	Vocational & Skill Enhancement Course (VSE)			2	1	2	1	2		8	8
8	Ability Enhancement Course (AE)	1	3							4	4
9	Entrepreneurship / Management Courses (EM)			1					3	4	4
10	Indian Knowledge System (IKS)	2								2	2
11	Value Education Course (VE)	2	2							4	4
12	Research Methodology (RM)								4	4	4
13	Field Project (FP)						2			2	2
14	Project (PR)							4		4	4
15	Internship (IN)								12	12	12
16	Co Curricular Course (CC)				2	2				4	4
	Total Credits	**21**	**22**	**23**	**21**	**23**	**20**	**21**	**19**	**167**	160-176

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General Instructions:

(1) 10% content of syllabus of each theory course shall be completed by the students with self-study. The 10% portion of each course (for self-study) shall be declared by the concerned course-coordinator at the beginning of teaching of the course.

(2) Student can complete **any Course** or programme elective courses PE1 to PE5 in "online" mode, offered through SWAYAM/ NPTEL portal or equivalent platform which provides Evaluation mechanism with the permission of Departmental Faculty Board (DFB). In this case –

(i) Students can register and complete these online courses any time after beginning of third semester, however, the student must successfully complete and pass the course, and submit the score card/certificate before declaration of result of respective semester in which the course is being offered.

(ii) In case, if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute in respective semester as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the course, and successfully complete the course.

(3) In eighth semester, the students have to complete mandatory internship of one semester in the company/ organization approved by the DFB.

(4) In eighth semester during internship, the students have to complete the theory courses in any one of the two modes:

(i) **Online courses** offered through SWAYAM/ NPTEL or equivalent platform which provides Evaluation mechanism with the permission of DFB: In this case, students can register and complete these online courses any time after beginning of third semester and complete the course and submit the score card/ certificate before declaration of result of eighth semester.

In case if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the course personally as per the schedule declared by the institute, and successfully complete the course.

(ii) **Self-study mode:** In this case the student will have to study the course offered by the institute of his/her own. The student shall appear for all the college assessments/ examinations (CT1/CT2, TA and ESE) personally as per the schedule declared by the institute and successfully complete the course.

(5) In addition to program specific courses, the students have to complete vocational skill courses, internship, field projects connected to **major degree**.

(6) Exit Option:

The exit option at the end of each year will be available to students after even semester. e. 2nd semester, 4th semester &6th semester and will commence from AY 2024-25 for UG Certificate, AY 2025-26 for UG Diploma, AY 2026-27 for B. Voc./B. Sc. Engineering degree.

(7) Students opting for exit at any level (after odd semesters or even semester) will have to earn additional eight credits before exit in skill based vocational courses and internship/apprenticeship/mini project to make them eligible to get UG certificate / UG Diploma or B. Voc./B. Sc. Engineering degree as per eligibility.

(8) Re Entry and Lateral Entry: Students opting for exit at any level after even semester, will have the option to re-enter the programme from where they left off in odd semesters within **four years of exit.** There shall be a gap of at least **one year** between exit and re-entry to UG programme.

(9) Students opting for exit after odd semester, i.e. 1st, 3rd, 5th or 7th semester will have the option to re-enter the programme from where they left off in even semesters only. There shall be a gap of at least **one year** between exit and re-entry to UG programme.

(10) Maximum period for completion of B. Tech. programme:

The student has to complete the degree programme within the stipulated **maximum period of eight years** from the date of admission to first year UG. The maximum duration of the programme includes the period of exit, withdrawal, absence and different kinds of leaves permissible to a student but it shall exclude the period of rustication of the student from the institute. However, genuine cases on confirmation of valid reasons may be referred to Academic Council for extending this limit by **additional one year**.

(11) Eligibility for admission to the UG Bachelor's Degree with Honours/ Research/Double Minor:

Students with minimum **CGPA of 7.5** without backlog courses at the end of fourth semester and should have earned 84 **credits** are eligible for admission to the UG Bachelor's Degree with Honours/ Research/ Double Minor.

SEMESTER –I														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
		Induction Program	TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
BS1	SH1121	Engineering Mathematics-I	3	1		4	15	15	10	60			100	4
BS2	SH1122	Engineering Physics	3			3	15	15	10	60			100	3
	SH1123	Engineering Physics Laboratory			2	2					25		25	1
ES1	EE1121	Basic Electrical Engineering	3			3	15	15	10	60			100	3
	EE1122	Basic Electrical Engineering Laboratory			2	2					25		25	1
ES2	CS1121	Programming for Problem Solving	2			2	15	15	10	60			100	2
	CS1122	Programming for Problem Solving Laboratory			2	2					25		25	1
ES3	ME1121	Workshop Practices			2	2					25		25	1
AE1	SH1124	Communication Skill			2	2	0	0			50		50	1
VE1	SH1125	Environment Science	2			2	15	15	20				50	2
IKS1	SH1126	Indian Knowledge System	2			2			40				40	2
Total			**15**	**1**	**10**	**26**	**75**	**75**	**100**	**240**	**150**		**640**	**21**

SEMESTER –II														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT-1	CT-2	TA	ESE	ICA	ESE		
BS3	SH1221	Engineering Mathematics-II	3	1		4	15	15	10	60			100	4
BS4	SH1222	Engineering Chemistry	2			2	15	15	10	60			100	2
	SH1223	Engineering Chemistry Laboratory			2	2					25		25	1
ES4	ME1221	Engineering Graphics	2			2	15	15	10	60			100	2
	ME1222	Engineering Graphics Laboratory			2	2					25		25	1
PC1	CS1221	Introduction to Computer Hardware and Networking	3			3	15	15	10	60			100	3
ES5	CS1222	Computer Hardware and Networking Lab			2	2					25		25	1
PC2	CS1223	Computational Thinking with Python	3			3	15	15	10	60			100	3
AE2	SH1224	Modern Indian Language		2		2	15	15	20				50	2
VE2	SH1225	Universal Human Value	2			2	15	15	20				50	2
MNC1	SH1226	Yoga &Fitness			2	2			20				20	0
AE3	SH1227	Language Laboratory			2	2					25		25	1
			15	**3**	**10**	**28**	**105**	**105**	**110**	**300**	**100**		**720**	**22**

Note : In first semester , the students of Civil, Electrical, Electronics & Telecommunication ,Instrumentation Engineering programmes will be offered the courses mentioned under Semester-I **AND** students of Mechanical , Computer Science Engineering and Information Technology will be offered the courses mentioned under Semester-II and in Second Semester Vice-versa except Engineering Mathematics-I (SH1121) and Engineering Mathematics-II (SH1221).

Equivalence Scheme

Programme Name:-B. Tech. Computer Science & Engineering

SN	Course code with Name of course (old)						Course code with Name of course (NEW)			Remark
	Revised Curriculum 2019-20			NEP Version I			NEP Version- II			
	Code	Name	Credit	Code	Name	Credit	Code	Name	Credit	
1	CSU221	Programming for Problem Solving	03	CS1101	Introduction to AI/ML	02	CS1121	Programming for Problem Solving	02	No equivalence with CSU221
2	CSU222	Programming for Problem Solving Lab	02	CS1102	Coding Laboratory	01	CS1122	Programming for Problem Solving Laboratory	01	No equivalence with CSU221
		------			------		CS1221	Introduction to Computer Hardware and Networking	03	Newly added
		-----			-----		CS1222	Computer Hardware and Networking Lab	01	Newly added
		------		CS1221	Computational Thinking with Python	03	CS1223	Computational Thinking with Python	03	

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Multiple exits: Following options are available for multiple exists:

Option	NCrF Level	Qualification Title	Additional credit requirement	Bridge courses
Exit-1	4.5	One year UG certificate course in Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at ITI Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project
Exit-2	5.0	Two year UG Diploma I Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at Diploma Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project
Exit-3	5.5	Three year Bachelor Degree in Vocation (B.Voc) orB.Sc. (Engg./Tech)	8	2 Month Internship **OR** Online Two skill courses at Degree Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project

EXIT CRITERIA FOR U. G. Certificate														
Category	Course Code	Name of the Course @	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT1	CT 2	TA	ESE	ICA	ESE		
EX1	CS1211	Web Designing									50		50	4
EX1	CS1212	Advanced Computer Tool Operator									50		50	4
OR														
EX1	CS1213	**Internship / Technical Project**									50@		50	8

@ Based on seminar, Internship Report, Internship/ Project evaluation

SEMESTER – I

Course Code	**CS1121**								**Course category**			ESA
Course Name	**PROGRAMMING FOR PROBLEM SOLVING**											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
02	00	00	02	15	15	10	60	**2**hr **3**0 min	00	00	100	02

Course Objectives:

1. To introduce basics of programming and develop logical thinking of students.
2. To help students understand how to model real world problems into the software
3. To implement mathematical statistical, applications into programming using C Language and python.
4. To implement data structure algorithms using programming language.
5. To implement file handling techniques.

Course Contents:

Introduction to Problem-Solving and Programming: Overview of problem-solving strategies, Problem decomposition and pattern recognition, Understanding problem domains, Introduction to python and C programming languages.

Basics of Data Structures using Python and C programming: Lists, tuples, and dictionaries, Arrays and pointers in C and python, implementing basic algorithms using data structures

Control Structures and Functions: Conditional statements (if-else), Loops statements, Functions and modular programming, Recursion

Searching and Sorting Algorithms: Linear and binary search, Bubble sort, selection sort, insertion sort, merge sort, quick sort. Analysis and comparison of searching and sorting algorithms

File Handling and Exception Handling: Reading and writing files in python and C. Handling exceptions and error gracefully

Introduction to Artificial Intelligence with Python Development: Introduction to AI, Types of AI, AI hardware and software tools, AI problem solving with python development tools

Text Books:

1. Walter Savitch, Problem Solving with C
2. John Zelle, Python Programming: AN Introduction to Computer Science

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Reference Books :

1. Cormen et al., Introduction to Algorithms
2. Eric Matthes Python Crash Course
3. Perry Xiao, Artificial Intelligence Programming with Python Willey publication, 1st edition, 2 May 2022

Course Outcomes:

CS1121.1. Simple algorithms for arithmetic and logical problems and translate the algorithms to programs. Implement conditional branching, iteration and recursion.
CS1121.2. Use arrays, pointers and structures to formulate algorithms and programs.
CS1121.3. Apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
CS1121.4. Apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.
CS1121.5. Implement file handling to solve real time problems.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CS1121.1	0	3	3	2	2	2	0	2	3	3	3	1	1	2	3
CS1121.2	1	2	2	1	3	1	2	1	0	1	2	2	1	1	3
CS1121.3	2	1	3	1	0	2	2		2	1	0	2	2	0	0
CS1121.4	3	2	3	1	2	0	1	2	1	3	1	2	0	3	2
CS1121.5	2	3	1	3	1	3	1	0	2	3	3	3	2	0	0

0-Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlate

Sign Member Secretary | Sign BoS Chairperson | Sign Dean (Academics) | Sign Principal

Course Code	**CS1122**	**Course category**	ESA
Course Name	**PROGRAMMING FOR PROBLEM SOLVING LABORATORY**		

Teaching Scheme				Examination Scheme							
				Theory				Practical			
Th	Tu	Pr	Total	CT	TA	ESE	ESE Duration	ICA	ESE	Total	Credits
00	00	02	02	00	00	00	----	25	00	25	01

Course Objectives:

1. To introduce basics of programming and develop logical thinking of students.
2. To help students understand how to model real world problems into the software
3. To implement mathematical statistical, applications into programming using Python and C Language.
4. To implement data structure algorithms using programming language.
5. To implement file handling techniques.

The sample list of programs is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

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

1. Simple computational problems using arithmetic expressions
2. Write a program to implement basic conditional logic- if, else if, and else statements.
3. Implement loops (for, while) to iterate through lists, perform a certain action, or solve iterative problems.
4. Manipulate lists and arrays: create, access, modify, and traverse elements.
5. Define and call functions with parameters and return values.
6. Implement various string operations.
7. Read from and write to files, handle exceptions for file operations.
8. Use try, except, finally blocks to handle exceptions and errors gracefully.
9. Implement basic algorithms such as sorting (e.g., bubble sort) searching (e.g., linear search)
10. Solve problems using recursive functions.

Course Outcomes:

The student will able to

CS1122.1 formulate the algorithms for simple problems and translate given algorithms to a working and correct program

CS1122.2 correct syntax errors as reported by the compilers

CS1122.3 write iterative as well as recursive programs

CS1122.4 represent data in arrays, strings and structures and manipulate them through a program

CS1122.5 declare pointers of different types and use them in defining self-referential structures.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CS1122.1	2	2	-	2	-	-	-	-	-	-	-	-	2	2	-
CS1122.2	2	3	1	2	--	-	-	-	-	-	-	-	3	2	-
CS1122.3	3	2	1	2	--	-	-	-	-	-	-	-	2	-	-
CS1122.4	3	2	1	-	-	-	1	-	-	3	-	-	3	-	2
CS1122.5	2	1	1	-	-	-	-	-	-	-	-	-	1	-	-

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlate

SEMESTER – II

Course Code	**CS1221**	**Course category**	ESA
Course Name	**INTRODUCTION TO COMPUTER HARDWARE AND NETWORKING**		

Teaching Scheme				Examination Scheme								
				Theory					Practical			Credits
Th	Tu	Pr	Total	CT 1	CT 2	TA	ESE	ESE Duration	ICA	ESE	Total	
03	00	00	03	15	15	10	60	**2**hr **3**0 min	00	60	100	03

Course Objectives:

1. To understand to identify hardware components of computer.
2. To Train the students to acquire knowledge in PC Hardware, Software and the field of Networking.
3. To understood and gain knowledge in the basics of PC assembling and networks.
4. To impart detailed knowledge on the setup and maintain of LAN with internet connection
5. To impart knowledge of installation, identification, repairing and upgrading all hardware equipment.

Course Content

Introduction to Computers

Introduction to computers, classification, generations, applications. Basic blocks of a digital computer. Hand Tools Basics and Specifications. Types of cabinets, relation with mother board form factor. Precautions to be taken while opening and closing PC cabinet. Main devices, components, Cards, boards inside a PC (to card or device level only). Types and specifications of the cables and connectors used for interconnecting the devices, boards, cards, components inside a PC.

Introduction to PC Hardware

Types of I/O devices and ports on a standard PC for connecting I/O devices. Function of keyboard, brief principle, types, interfaces, connectors, cable. Function of Mouse, brief principle, types, interfaces, connectors, cable. Function of monitor, brief principle, resolution, size, types, interfaces, connectors, cable. Function of Speakers and Mic, brief principle, types, interfaces, connectors, cable. Function of serial port, parallel port, brief principle of

communication through these ports, types of devices that can be connected, interface standards, connectors, cable.

Assemble Hardware

Specifications of processors (Intel Celeron, P4family, Xeon dual core, quad core, core2 duo, i3, i5, i7 and AMD). Memory devices, types, principle of storing. Data organization 4bit, 8-bit, word. Semiconductor memories, RAM, ROM, PROM, EMPROM, EEPROM, Static and dynamic.

Introduction to Hard disk Partition and formatting and OS installation

Basics of Hard Drive and its working, Inside the Hard Drive: Hard Drive Motherboard, Desktop Hard Drive Buyer's Guide, Introduction to RAID, Using Multiple Hard Drives for Performance and Reliability, Partitioning a hard disk (primary and extended partitions).

Computer Networking

Fundamental of Networks, Configure the LAN, MAN, WAN Networks, Configure the peer to peer & server client Networking, Introduction to Networking Device (Hub, Switch, Bridge, Router) Installing LAN Card & configure IP Addressing, Infrastructure of networking

Text Book:

1. Complete Reference PC Hardware, Craig Zacker, John Rourke, Mc Graw Hill Publication
2. Mastering PC Hardware & Networking, Dr. Ajit Mittal, Dr. Ajay Rana

Course Outcome:

CS1222.1 Assemble and repair Desktop Computer with all its hardware components.

CS1222.2 Install different Operating System and all other application software.

CS1222.3 Set up and configure Networking System using various network devices.

CS1222.4 Share and control resource and Internet connection through network.

CS1222.5 Install and configure Windows server.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CS1221.1	2	2	-	-	-	-	-	-	-	-	-	-	2	2	-
CS1221.2	2	3	1	2	--	-	-	-	-	-	-	-	3	-	1
CS1221.3	3	2	1	2	--	-	-	-	-	-	-	-	2	-	1
CS1221.4	3	2	1	2	--	-	-	-	-	-	-	-	2	-	1
CS1221.5	3	2	1	2	--	-	-	-	-	-	-	-	2	-	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	**CS1222**	**Course category**	ESA
Course Name	**INTRODUCTION TO COMPUTER HARDWARE AND NETWORKING LABORATORY**		

Teaching Scheme				Examination Scheme								
				Theory					Practical			
Th	Tu	Pr	Total	CT 1	CT 2	TA	ESE	ESE Duration	ICA	ESE	Total	Credits
00	00	02	02	15	15	00	00	----	25	00	25	01

Course Objectives:

1. To understand to identify hardware components of computer.
2. To Train the students to acquire knowledge in PC Hardware, Software and the field of Networking.
3. To understood and gain knowledge in the basics of PC assembling and networks.
4. To impart detailed knowledge on the setup and maintain of LAN with internet connection
5. To impart knowledge of installation, identification, repairing and upgrading all hardware equipment.

Course Content:

The sample list of programs is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. Hardware Identification
2. Remove-Test Replace/ Install
3. User Account Customization
4. Junk File Removal
5. Data backup and data recovery
6. Outlook Configure & Backup
7. Practical on Computer Network:

8. Identify various Network tools like: (a) Wire crimper, (b) Wire Map Testers, (c) Multifunction Cable Tester, (d) LAN Tester, (e) Tone Generator etc. Identify various Network device like: (a) Switch (Normal and Managed), (b) Router (Normal and wireless), (c) Rack, Patch Panel, i/o box, (d) Access Point etc. Understand the Layout of network on your lab and campus

9. Crimping, Punching and Network configuration: Practice crimping with straight and cross CAT 6 cables.

10. Create cabling in a lab with HUB/Switch and IO Boxes and patch panel.

Text Book:

1. Complete Reference PC Hardware, Craig Zacker, John Rourke, Mc Graw Hill Publication

2. Mastering PC Hardware & Networking, Dr. Ajit Mittal, Dr. Ajay Rana

Course Outcome:

CS1222.1 Assemble and repair Desktop Computer with all its hardware components.

CS1222.2 Install different Operating System and all other application software.

CS1222.3 Set up and configure Networking System using various network devices.

CS1222.4 Share and control resource and Internet connection through network.

CS1222.5 Install and configure Windows server.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CS1222.1	2	2	-	-	-	-	-	-	-	-	-	-	2	2	-
CS1222.2	2	3	1	2	--	-	-	-	-	-	-	-	3	-	1
CS1222.3	3	2	1	2	--	-	-	-	-	-	-	-	2	-	1
CS1222.4	3	2	1	2	--	-	-	-	-	-	-	-	2	-	1
CS1222.5	3	2	1	2	--	-	-	-	-	-	-	-	2	-	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	**CS1223**								**Course category**			**PC**
Course Name	**COMPUTATION THINKING WITH PYTHON**											
Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT 2	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	15	15	10	60	2 Hrs 30 Min	--	60	100	03

Course Objective:

To make the students aware and understand:

1. To introduce core programming basics and problem solving
2. To Demonstrate the concept of control structure and looping,
3. To Demonstrate the concept of classes , object, function and operation on various data structure
4. To demonstrate about Python string and file handling ,
5. To understand about Functions, Modules and Mat plot library in Python Programming

Course Content:

Introduction and problem solving: Introduction to python programming, History, Feature and application of Python Programing, Input-Output, Indentation. Types - Integers, Strings, Booleans

Programming Fundamentals & Control Structures: Interactive and Script Mode, Comments, Variables, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, control flow if, if else, nested if else, loops, while, for, nested loops, break, continue and pass,

Class and Object and Function: Classes, Object, Methods and Constructors, Various operations on List, Tuple, Set, and Dictionaries, functions: optional arguments, default values, Passing functions as arguments, recursion, Importing Packages.

Strings and File Handling: String processing. Various String Operation such as comparison , slicing , splitting , Stripping etc. , Exception handling, Basic input/output, Handling files and Various operation of Files such as Create, open, Read. Write, Append and Close,

Visualization in Python: Matplotlib Package – Plotting Graph - Controlling Graphs – Adding Text – More Graph Types – Getting and Setting Values in graph

Text Books

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson, 2017.
2. Mark Lutz, Learning Python, Orielly, 3 Edition 2007.
3. Ashwin Pajankar Hands-on Matplotlib: Learn Plotting and Visualizations with Python

Reference Books

1. Think Python, 2 Edition, 2017 Allen Downey, Green Tea Press
2. Core Python Programming, 2016 W.Chun, Pearson.
3. Introduction to Python, 2015 Kenneth A. Lambert, Cengages
4. Matthes, ***Eric***, ***Python*** crash course : a hands-on, project-based introduction to ***programming***
5. https://www.w3schools.com/python/python_reference.asp
6. https://www.python.org/doc/
7. https://archive.nptel.ac.in/courses/106/106/106106182/
8. https://nptel.ac.in/courses/115104095

Course Outcomes:

Student should be able to

CS1223.1	Understand the basic concepts and problem solving in python
CS1223.2	understand the conditional and lopping statements
CS1223.3	Explore python data structures like Lists, Tuples, Sets and dictionaries.
CS1223.4	Explore python the string and file handling concept
CS1223.5	Ability to create practical and contemporary applications using Functions, Modules and mat plot libraries

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CS1223.1	3	3	2	---	-	-	-	-	-	-	-	-	2	--	2
CS1223.2	3	3	2	---	--	-	-	-	-	-	-	-	3	1	1
CS 1223.3	1	3	3	2	--	--	---	--	--	--	--	3	3	1	3
CS1223.4	3	2	3	---	---	--	--	--	--	--	--	2	3	--	2
CS1223.5	3	1	2	--	--	-	-	-	-	-	-	2	2	1	1

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	**CS1211**	**Course category**	EX1
Course Name	**WEB DESIGNING**		

Teaching Scheme				Examination Scheme							
				Theory				Practical		Total	Credits
Th	Tu	Pr	Total	CT	TA	ESE	ESE Duration	ICA	ESE		
00	00	00	02	00	00	00	----	50	00	50	04

Course Objectives:

To make the students aware and understand:

1. The fundamentals of web design
2. Web application development procedures
3. Using environment, frameworks and tools to create websites
4. The basics of database and the connection with web pages
5. Develop the skills to create fully functional and responsive web sites.

Course Contents:

Introduction to the Basics of Web

Web Basics: Internet, Intranet, WWW, Static and Dynamic Web Page; Web Clients; Web Servers; Client Server Architecture: Single Tier, Two-Tier, Multi-Tier; HTTP: HTTP Request and Response; URL, Client Side Scripting, Server Side Scripting, Web 1.0, Web 2.0, SDLC

Hyper Text Markup Language

Introduction to HTML: Elements of HTML Document; HTML Elements and HTML Attributes, Headings, Paragraph, Division, Formating: b, i, small, sup, sub; Spacing: Pre, Br; Formatting Text Phrases: span, strong, tt; Image element; Anchors; Lists: Ordered and Unordered and Definition; Tables; Frames; Forms: Form Elements, ID attributes, Class Attributes of HTML Elements; Meta Tag, Audio, Video, Canvas, Main, Section, Article, Header, Footer, Aside, Nav, Figure Tags; HTML Events: Window Events, Form Element Events, Keyboard Events, Mouse Events

Cascading Style Sheets

Introduction; Cascading Style Sheets (CSS); CSS Syntax; Inserting CSS: Inline, Internal, External, ID and Class Selectors; Colors; Backgrounds; Borders; Text; Font; List; Table; CSS Box Model; Normal Flow Box Layout: Basic Box Layout, Display Property, Padding, Margin; Positioning: Relative, Float, Absolute; CSS3

Borders, Box Shadows, Text Effects and shadow; Basics of Responsive Web Designs; Media Queries, Introduction to Bootstrap

Client Side Scripting with JavaScript

Structure of JavaScript Program; Variables and Data Types; Statements: Expression, Keyword, Block; Operators; Flow Controls, Looping, Functions; Popup Boxes: Alert, Confirm, Prompt; Objects and properties; Constructors; Arrays; Built-in Objects: Window, String, Number, Boolean, Date, Math, RegExp, Form, DOM; User Defined Objects; Event Handling and Form Validation, Error Handling, Handling Cookies, jQuery Syntax; jQuery Selectors, Events and Effects; Introduction to JSON

Server Side Scripting using PHP

PHP Syntax, Variables, Data Types, Strings, Constants, Operators, Control structure, Functions, Array, Creating Class and Objects, PHP Forms, Accessing Form Elements, Form Validation, Events, Cookies, and Sessions, Introduction to oracle database, Connecting to Database, Creating, Selecting, Deleting, Updating Records in a table, Inserting Multiple Data

Text Books:

1. Web Design with HTML, CSS, JavaScript and jQuery Set, Jon Duckett, John Wiley & Sons
2. Learning PHP, MySQL & JavaScript: with jQuery, CSS & HTML5, Robin Nixon, O'Reilly

Reference Books and Websites:

1. Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and AJAX, Black Book, Dreamtech Press
2. HTML, XHTML, and CSS Bible by Steven M. Schafer, Fifth Edition, Wiley Publishing, Inc.

Course Outcomes:

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

CS1211.1	To create the user friendly UI using HTML, CSS etc.
CS1211.2	To script client and server side as per the requirements using Java Script.
CS1211.3	To create visualization as per UI/UX theories.
CS1211.4	Analyze the requirements from web site owner and deliver to their satisfaction.
CS1211.5	Create fully functional, usable, interactive, user friendly and responsive Web Sites.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CS1211.1	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CS1211.2	2	3	1	2	--	-	-	-	-	-	-	-	3	-	-
CS1211.3	3	2	1	2	--	-	-	-	-	-	-	-	2	-	-
CS1211.4	3	2	1	-	-	-	1	-	-	-	-	-	3	-	-
CS1211.5	2	1	1	-	-	-	-	-	-	-	-	-	2	-	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	**CS1212**							**Course category**			EX2
Course Name	**ADVANCED COMPUTER TOOL OPERATOR**										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				CT	TA	ESE	ESE Duration	ICA	ESE		
00	00	00	02	00	00	00	----	50	00	50	04

Course Objective:

To make the student aware and understand about

1. The basics of content development and its various tools.
2. Usage of e-Publication tools for virtual reality.
3. To design e-Content in sales and marketing to analyse the customer.
4. How to create and customize presentation.
5. To implement e-Commerce application using all the content development tools.

Course Content:

The fundamentals of content development: E-publications and virtual reality, Tools for multimedia content development for graphics, screen-casting, presentations, and audio/video, Developing content for social media platform as like blog and wiki.

Hosting websites: Using CMS applications Drupal and Joomla, Using e-learning platform Moodle. Managing multimedia content, screen-casting tools and techniques.

E-Content Design: Use of Content Authoring Tools for Content creation, Communication and internal organization, Sales and logistics, Marketing, Analytics and Customer service.

Documentation & Presentation Tools: Use of Graphics & Animation, Audio and Podcasting, Online Video Creation, Surveys/Polling/Quizzes

Case Study on development of application of content development using all concepts given above.

Course Outcomes:

At the end of course student will be able to

CS1212.1 Understand the basics of e-Content development.
CS1212.2 Analyse the need of e-Content development for market analytics.
CS1212.3 Design content for publishing.
CS1212.4 Apply the various graphical tools for creating attractive e-content.
CS1212.5 Design real life model using case study.

CO/PO Mappings:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CS1212.1	-	1	-	-	2	-	-	-	-	2	-	-	2	-	-
CS1212.2	2	3	1	2	--	-	-	-	-	3	-	-	3	-	-
CS1212.3	3	2	1	2	--	-	-	-	2	-	-	-	2	-	-
CS1212.4	2	2	1	-	-	-	1	-	-	-	-	-	3	-	-
CS1212.5	2	1	1	-	-	-	-	-	1	-	-	-	2	-	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Curriculum Structure for B. Tech. Information Technology Engineering Programme

(In light of NEP 2020)

NCrF Level 6

For students admitted in 2024-25 onwards

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)
Near Kathora Naka, Amravati, Maharashtra
PIN 444604
www.gcoea.ac.in

Sign
Member Secretary

Sign
BoS Chairperson

Sign
Dean Academics

Sign
Principal

Structure for B. Tech. Programme In light of NEP 2020

For students admitted in 2024-25 onwards

Key Features of Curriculum

1. Multiple entry and exit option after every year.
2. Provision for Open Electives (OE), Vocational and Skill Enhancement Courses (VSE), Ability Enhancement Courses (AE), Indian Knowledge System (IKS), Value Education Courses (VE), Co-Curricular Courses (CC) in addition to program core courses.
3. Mandatory internship of one semester.
4. Credits for Value education courses, Ability Enhancement Courses, Co-Curricular Curricular Activities.
5. Mandatory Non-Credit Courses.
6. Interdisciplinary and multidisciplinary education through single and double minors and open electives.
7. Skill based courses and multiple exit level.
8. Provision for learning in online mode through Swayam/ NPTEL etc courses
9. Provision for B.Tech. Honours with Research degree through research project.
10. Opportunity for learner to choose courses of their interest in all disciplines.
11. Provision of Skill Based Courses and internship/Field project/mini projects for exit options at each level.
12. Flexibility for all types of learners i.e. Good, Normal and Exit

Good Students	Normal Students	Exit
B. Tech. Major with Multidisciplinary Minor	B. Tech. Major with Multidisciplinary Minor	Additional 08 credits in the form of skill-based courses / labs, internship, mini projects shall be offered in 8 weeks.
B. Tech. Honorsand MultidisciplinaryMinor	--	
B. Tech. Honorswith Researchand Multidisciplinary Minor	--	
B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	--	

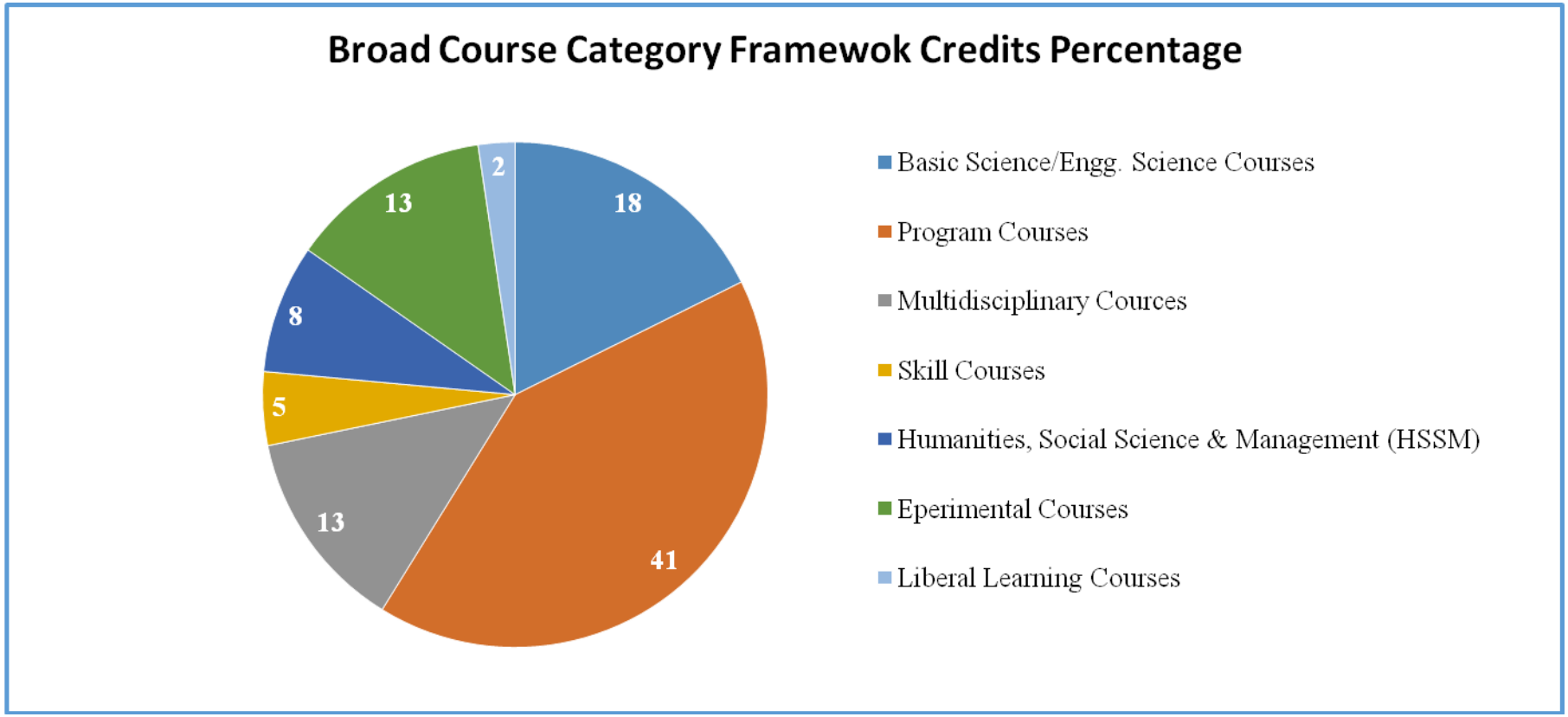
Credit Distribution for each year and Exit Option

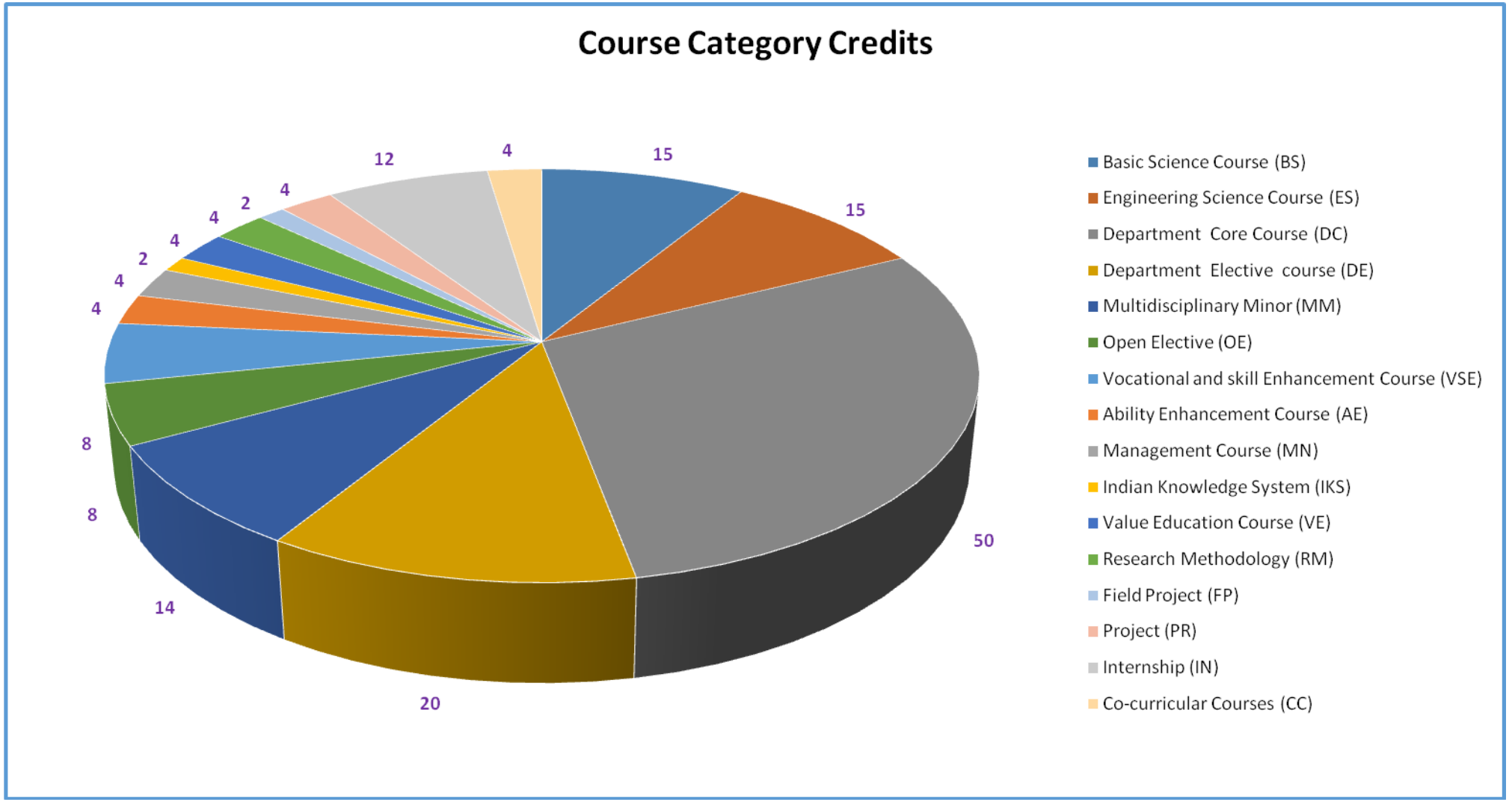
NCrFLevel	Year / Semester	Exit Option	Credits	Additional Credits for exit students	Total Credits
4.5	Semester I & II	U. G. Certificate	43	08	51
5.0	Semester III & IV	U. G. Diploma	88	08	96
5.5	Semester V & VI	B. Vocational/B.Sc. Engg.	127	08	133
6.0	Semester VII & VIII	B. Tech. Major with Multidisciplinary Minor	167	--	167
		B. Tech. Honors and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. Honors with Research and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	167+18=185	--	185

Course Category-wise Credit Distribution

Course Category	As per NEP GR	GCOEA Credits	CC	As per NEP GR	GCOEA Credits
BSC/ESC	30	30	BS	14-18	18
			ES	16--12	12
Program Courses	64-76	67	PC	44-56	47
			PE	20	20
Multidisciplinary Courses	22	22	MM	14	14
			OE	8	8
Skill Courses	8	8	VSE	8	8
Humanities, Social Science & Management (HSSM)	14	14	AE	4	4
			EM	4	4
			IKS	2	2
			VE	4	4
Experiential Courses	22	22	RM	4	4
			FP	2	2
			PR	4	4
			IN/OJT	12	12

Liberal Learning Courses	4	4	CC	4	4
Total Credits	**164-176**	**167**		**164-176**	**167**


Broad Course Category Framewok Credits Percentage
18
41
13
5
8
13
2
Basic Science/Engg. Science Courses
Program Courses
Multidisciplinary Cources
Skill Courses
Humanities, Social Science & Management (HSSM)
Eperimental Courses
Liberal Learning Courses



Sign
Member Secretary

Sign
BoS Chairperson

Sign
Dean Academics

Sign
Principal

Semester-wise Credit Distribution

Sr. No.	SEM	I	II	III	IV	V	VI	VII	VIII	Total Credits	NEP Requirement
1	Basic Science Course (BS)	8	7	3						18	14-18
2	Engineering Science Course (ES)	8	4							12	12-16
3	Program Core Course (PC)		6	13	13	9	3	3		47	44-56
4	Program Elective Course (PE)					4	8	8		20	20
5	Multidisciplinary Minor Course (MM)			3	3	3	3	2		14	14
6	Open Elective Course (OE)				3	3		2		8	8
7	Vocational & Skill Enhancement Course (VSE)			2	2	1	1	2		8	8
8	Ability Enhancement Course (AE)	1	3							4	4
9	Entrepreneurship / Management Courses (EM)			1					3	4	4
10	Indian Knowledge System (IKS)	2								2	2
11	Value Education Course (VE)	2	2							4	4
12	Research Methodology (RM)								4	4	4
13	Field Project (FP)						2			2	2
14	Project (PR)							4		4	4
15	Internship (IN)								12	12	12
16	Co Curricular Course (CC)				2	2				4	4
	Total Credits	**21**	**22**	**22**	**23**	**22**	**17**	**21**	**19**	**167**	164-176

General Instructions:

(1) 10% content of syllabus of each theory course shall be completed bythe students with self-study. The 10% portion of each course (for self-study) shall be declared by theconcerned course-coordinator at the beginning of teaching of the course.

(2) Student can complete **any Course** or programme elective coursesPE1 to PE5 in "online" mode, offered through SWAYAM/ NPTELportal or equivalent platform which provides Evaluation mechanismwith the permission of Departmental Faculty Board (DFB). In this case –

(i) Students can register and complete these online courses any time after beginning of third semester, however, the student must successfully complete and pass the course, and submit the score card/certificate before declaration of result of respective semester in which the course is being offered.

(ii) In case, if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute in respective semester as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the course, and successfully complete the course.

(3) In eighth semester, the students have to complete mandatory internship of one semester in the company/ organization approved by the DFB.

(4) In eighth semester during internship, the students have to complete the theory courses in any one of the two modes:

(i) **Online courses** offered through SWAYAM/ NPTELor equivalent platform which provides Evaluation mechanismwith the permission of DFB: In this case, students can register and complete these online courses any time after beginning of third semester and complete the course and submit the score card/ certificate before declaration of result of eighth semester.

In case if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the course personally as per the schedule declared by the institute, and successfully complete the course.

(ii) **Self-study mode:** In this case the student will have to study the course offered by the institute of his/her own. The student shall appear for all the college assessments/ examinations (CT1/CT2, TA and ESE) personally as per the schedule declared by the instituteand successfully complete the course.

(5) In addition to program specific courses, the students have to complete vocational skill courses, internship, field projects connected to **major degree**.

(6) Exit Option:

The exit option at the end of each year will be available to students after even semester. e. 2^{nd} semester, 4^{th} semester &6^{th} semester and will commence from AY 2024-25 for UG Certificate, AY 2025-26 forUG Diploma, AY 2026-27 for B. Voc./B. Sc. Engineering degree.

(7) Students opting for exit at any level (after odd semesters or even semester) will have to earn additional eight credits before exit in skill based vocational courses and internship/apprenticeship/mini project to make them eligible to get UG certificate / UG Diploma or B. Voc./B. Sc. Engineering degree as per eligibility.

(8) Re Entry and Lateral Entry: Students opting for exit at any level after even semester, will have the option to re-enter the programme from where they left off in odd semesters within **four years of exit.**There shall be a gap of at least **one year**between exit and re-entry to UG programme.

(9) Students opting for exit after odd semester, i.e. 1^{st}, 3^{rd}, 5^{th} or 7^{th} semester will have the option to re-enter the programme from where they left off in even semesters only.There shall be a gap of at least **one year**between exit and re-entry to UG programme.

(10) Maximum period for completion of B. Tech. programme:

The student has to complete the degree programme within the stipulated **maximum period of eight years** from the date of admission to first year UG. The maximum duration of the programme includes the period of exit, withdrawal, absence and different kinds of leaves permissible to a student but it shall exclude the period of rustication of the student from the institute. However, genuine cases on confirmation of valid reasons may be referred to Academic Council for extending this limit by **additional one year**.

(11) Eligibility for admission to the UG Bachelor's Degree with Honours/ Research/Double Minor:

Students with minimum **CGPA of 7.5** without backlog courses at the end of fourth semester and should have earned 84**credits** are eligible for admission to the UG Bachelor's Degree with Honours/ Research/ Double Minor.

SEMESTER –I														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
		Induction Program	TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
BS1	SH1121	Engineering Mathematics-I	3	1		4	15	15	10	60			100	4
BS2	SH1122	Engineering Physics	3			3	15	15	10	60			100	3
	SH1123	Engineering Physics Laboratory			2	2					25		25	1
ES1	EE1121	Basic Electrical Engineering	3			3	15	15	10	60			100	3
	EE1122	Basic Electrical Engineering Laboratory			2	2					25		25	1
ES2	CS1121	Programming for Problem Solving	2			2	15	15	10	60			100	2
	CS1122	Programming for Problem			2	2					25		25	1

		Solving Laboratory												
ES3	ME1121	Workshop Practices			2	2					25		25	1
AE1	SH1124	Communication Skill			2	2					50		50	1
VE1	SH1125	Environment Science	2			2	15	15	20				50	2
IKS1	SH1126	Indian Knowledge System	2			2			40				40	2
Total			**15**	**1**	**10**	**26**	**75**	**75**	**100**	**240**	**150**		**640**	**21**

SEMESTER –II

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT-1	CT-2	TA	ESE	ICA	ESE		
BS3	SH1221	Engineering Mathematics-II	3	1		4	15	15	10	60			100	4
BS4	SH1222	Engineering Chemistry	2			2	15	15	10	60			100	2
	SH1223	Engineering Chemistry Laboratory			2	2					25		25	1
ES4	ME1221	Engineering Graphics	2			2	15	15	10	60			100	2
	ME1222	Engineering Graphics Laboratory			2	2					25		25	1

PC1	IT1221	Python Programming	3			3	15	15	10	60			100	3
ES5	IT1222	Python Programming Lab			2	2					25		25	1
PC2	IT1223	Discrete Mathematics	3			3	15	15	10	60			100	3
AE2	SH1224	Modern Indian Language		2		2	15	15	20				50	2
VE2	SH1225	Universal Human Value	2			2	15	15	20				50	2
MNC1	SH1226	Yoga &Fitness			2	2			20				20	0
AE3	SH1227	Language Laboratory			2	2					25		25	1
			15	**3**	**10**	**28**	**105**	**105**	**110**	**300**	**100**		**720**	**22**

Note : In first semester , the students of Civil, Electrical, Electronics & Telecommunication ,Instrumentation Engineering programmes will be offered the courses mentioned under Semester-I **AND** students of Mechanical , Computer Science Engineering and Information Technology will be offered the courses mentioned under Semester-II and in Second Semester Vice-versa except Engineering Mathematics-I (SH1121) and Engineering Mathematics-II (SH1221).

Equivalence Scheme

Programme Name:-B. Tech. Information Technology

S N.	Course code with Name of course (old)						Course code with Name of course(NEW) (NEP Version-II)		
	Revised Curriculum 2019-20			NEP Version I					
	Code	Name	Credit	Code	Name	Credit	Code	Name	Credit
				IT1215	Python Programming	2	IT1221	Python Programming	3
				IT1216	Python Programming Lab	1	IT1222	Python Programming Lab	1
				IT1211	Apprenticeship/ Internship	3	IT1213	Internship / Technical Project	8
				IT1212	Web Information Management	3	No equivalence		
				IT1213	Web Development Laboratory	2	No equivalence		
							IT1211	Certified Web Developer(Level 3)	4
							IT1212	Course on Computer	4

Sign
Member Secretary

Sign
BoS Chairperson

Sign
Dean Academics

Sign
Principal

								Concepts(level 2)	

Multiple exits: Following options are available for multiple exists:

Option	NCrF Level	Qualification Title	Additional credit requirement	Bridge courses
Exit-1	4.5	One yr. UG certificate course in Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at ITI Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project
Exit-2	5.0	Two Yr UG Diploma I Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at Diploma Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project

Exit-3	5.5	Three Yr Bachelor Degree in Vocation (B.Voc) orB.Sc. (Engg./Tech)	8	2 Month Internship **OR** Online Two skill courses at Degree Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project

EXIT CRITERIA FOR U. G. Certificate

Category	Course Code	Name of the Course @	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
EX1	IT1211	Certified Web Developer(Level 3)									50		50	4
EX1	IT1212	Course on Computer Concepts(level 2)									50		50	4
OR														

Sign
Member Secretary

Sign
BoS Chairperson

Sign
Dean Academics

Sign
Principal

EX1	IT1213	Internship / Technical Project									50@		50	8

Co-Curricular Course:: Active Participation in Activities such as: Sports, Tech-fest, College Club Activity, University level /college level cultural activities, Drama, painting ,annual day, department student's association/IE/ISTE, paper presentation, foreign language certificate, NCC etc

Co-Curricular Course Activities minimum hours ::2 hours per week or 24 hours

Course Code	IT1221							Course category			PC1
Course Name	PYTHON PROGRAMMING										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	30	10	60	02 Hrs 30 min	--	--	100	03

COURSE OBJECTIVES

1. To develop Python programs with conditionals, loops and functions.
2. To use Python data structures – lists, tuples, dictionaries.
3. To explore various file operations and OOPS and advanced concepts.

Basics of Python Programming The Programming Cycle for PythonIDE, Interacting with Python Programs Elements of Python, Type Conversion.Variables, expressions and statements, Functions, Case Study: interface, design, Conditionals and recursion, Fruitful functions, Iteration Strings, Case Study: word play.

Lists, Strings Lists, tuples, and dictionaries - basic list operators - replacing, inserting, removing an element, searching and sorting lists. Dictionary literals, adding and removing keys, accessing and replacing values, traversing dictionaries. String manipulations: subscript operator, indexing, slicing a string; strings and number system.

Files and OOPS Files: Reading and Writing, Format operator, Filenames and path, Databases, Pickling, Pipes, Writing Modules - Classes and functions, Inheritance, Data encapsulation, data modelling persistent storage of objects polymorphism - operator overloading abstract classes exception handling.

GUI Graphical user interfaces; event driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes sizes, fonts, colours layouts, nested frames

Plotting, Data Visualisation and Regular expression, Design Patterns.

TEXT BOOKS

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition, Updated for Python 3, Shroff O'Reilly Publishers, 2016.

2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python –Revised and updated for Python 3.2", Network Theory Ltd., 2011.

REFERENCE BOOK

1. Martin C. Brown, "Python, the complete Reference", Tata McGraw-Hill, 2001
2. Arockia Mary P, Problem Solving and Python Programming, Shanlax Publications, 2021.

Online Resources

C. Morris, "https://www.kaggle.com/learn/python," [Online]

https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

https://w3resource.com/python-exercises/

https://www.python.org/about/gettingstarted/

https://wiki.python.org/moin/BeginnersGuide/Download

COURSE OUTCOMES

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

IT1221.1 Develop simple Python programs for solving problems.

IT1221.2 Represent compound data using Python lists, tuples and dictionaries.

IT1221.3 Design Python Programs to Read and write data from/to files

IT1221.4 Develop GUI applications for various modules.

IT1221.5 Investigate python's role in different fields.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1221.1	2	3	1	1	1	0	0	0	0	0	0	1	2	1	1
IT1221.2	3	3	2	1	1	0	0	0	0	0	0	1	2	1	1
IT1221.3	3	3	3	1	1	0	0	1	0	0	0	2	2	2	2
IT1221.4	3	3	3	1	1	0	0	1	0	0	0	2	2	2	2
IT1221.5	2	3	3	1	1	2	2	2	1	1	3	2	2	2	3

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	IT1222						Course category			ES5
Course Name	PYTHON PROGRAMMING LABORATORY									
Teaching Scheme				Examination Scheme						Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
--	--	02	--	--	--	--	---	25	--	25	01

Course Objective

1. Exposing students to free open source software, Python and to open source packages freely available.
2. Enabling students to learn programming aspects of python to solve real-life problems and solution finding process.
3. Introduce open source software paradigm to provide exposure of collaborative team and software creation with current open source world events.

Suggested/Indicative List of Experiments/Assignments, Instructor may conduct any 10 practical based on given list:

(Note: a. Experiments/assignments can be given to students by the instructor as per current scenario of workability and availability of the technology with a flexibility of students' choice in selecting the experiments from the given list. b. Experiments aim can be updated or modified or scaled up as per the requirements of the lab sessions and can be chosen from the reference websites)

Introduction: Open Source definition, open source technology importance in a perspective of Free and open Source Software (FOSS)

I: Introduction and syntax of Python programming

II: Python operators and Looping structures

III: Data Structures in Python

IV: Python Functions, Modules and Packages

V: Object Oriented Programming in Python

I. Experiment on basic control structures & loops.

a) Write a program for checking the given number is even or odd.

b) Using a for loop, write a program that prints the decimal equivalents of 1/2, 1/3, 1/4 ,..... 1/10

c) Write a program for displaying reversal of a number.

d) Write a program for finding biggest number among 3 numbers.

e) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

II. Experiment on operators & I/O operations.

a) Write a program that takes 2 numbers as command line arguments and prints its sum.

b) Implement python script to show the usage of various operators available in python language.

c) Implement python script to read person's age from keyboard and display whether he is eligible for voting or not.

d) Implement python script to check the given year is leap year or not.

III. Experiment on Python Script.

a) Implement Python Script to generate first N natural numbers.

b) Implement Python Script to check given number is palindrome or not.

c) Implement Python script to print factorial of a number.

d) Implement Python Script to print sum of N natural numbers.

e) Implement Python Script to check given number is Armstrong or not.

IV. Experiment on Lists.

a) Finding the sum and average of given numbers using lists.

b) To display elements of list in reverse order.

c) Finding the minimum and maximum elements in the lists.

d) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

e) Write a program to compute the number of characters, words and lines in a file.

V. Experiment on Strings.

a) Implement Python Script to perform various operations on string using string libraries.

b) Implement Python Script to check given string is palindrome or not.

c) Implement python script to accept line of text and find the number of characters, number of vowels and number of blank spaces in it.

VI. Experiment on functions.

a) Define a function max_of_three() that takes three numbers as arguments and returns the largest number

b) Write a program which makes use of function to display all such numbers which are divisible by 7 but are not a multiple of 5, between 1000 and 2000.

c) Write a program to perform addition of two square matrices.

VII. Experiment on recursion & parameter passing techniques.

a) Define a function which generates Fibonacci series up to n numbers.

b) Define a function that checks whether the given number is Armstrong

c) Implement a python script for Call-by-value and Call-by-reference

d) Implement a python script for factorial of number by using recursion.

VIII. Experiment on Tuples.

a) Write a program which accepts a sequence of comma-separated numbers from console and generate a list and a tuple which contains every number. Suppose the following input is supplied to the program: 34, 67, 55, 33, 12, 98. Then, the output should be: ['34', '67', '55', '33', '12', '98'] ('34',67', '55', '33', '12', '98').

b) With a given tuple (1, 2, 3, 4, 5, 6, 7, 8, 9, 10), write a program to print the first half values in one line and the last half values in one line.

IX. Experiment on files.

a) Write Python script to display file contents.

b) Write Python script to copy file contents from one file to another.

X. Experiment on searching & sorting Techniques.

a) Implement a python script to check the element is in the list or not by using Linear search & Binary search.

b) Implement a python script to arrange the elements in sorted order using Bubble, Selection, Insertion and Merge sorting techniques.

XI. Experiment on Exception handling concepts.

a) Write a python program by using exception handling mechanism.

b) Write a python program to perform various database operations (create, insert, delete, update).

XII. Experiment on:

a) Write a program to calculate overtime pay of 10 employees. Overtime is paid at the rate of Rs.12.00 per hour for every hour worked above 40 hours. Assume that employee do not work for fractional part of an hour. Write a program to calculate overtime pay of 10 employees. Overtime is paid at the rate of Rs.12.00 per hour for every hour worked above 40 hours. Assume that employee do not work for fractional part of an hour.

b) Write a function that receives marks received by a student in 3 subjects and returns the average and percentage of these marks. Call this function from main () and print the result in main.

c) Write a program to demonstrate database connectivity in python.

d) Write a script that imports requests and fetch content from the page. Eg. (Wiki)

XIII. Experiments on python Framework.(Architecture of any python Framework (Flask, Django etc.)

a) Create a virtual environment and start a project by installing necessary packages

b) Connect Database with your project.

c) Generate HTML Forms with Form class and store data into the database.

d) Create a Word Counter in any Framework. (The counter will count the number of occurrence of each word in a paragraph).

e) Create an application to send emails using any framework.

f) Create a Login System using any Framework.

g) Create an Online School System where teacher can create assignments that students can complete and view their results.

h) Create a Weather Application using any Framework and integrate it with some APIs (Application Program Interface).

i)Introduction and small exercises on packages such as - Matplotlib (for the graph plotting), Tkinter (Python GUI programming package), Python web application using Flask, Web2py packages.

j) Introduction to Anaconda Navigator for python.

XIV. Mini Project on:

1. Develop a mini-project of students' choice to demonstrate creativity. Eg. music player, game-station, student management systems, library management system etc.

a) Create a To-Do List app with registration, login, and CRUD Functionality.

b) Create a Chatting Application with Python.

c) Create a Token-based authentication system to work.

d) Create a Resume Builder and download that resume.

e) Create an app to take notes and store those notes in the backend database.

f) Automatic Tweet Posting

g) Railway Enquiry System.

h) Online Quiz Application

i) Ecommerce website, etc

Course Outcomes

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

IT1222.1 Implement various applications using open source system of Python

IT1222.2 Create simple GUI applications and develop experiments using Python

IT1222.3 Develop solutions to real- world problems in constructive ways by

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1222.1	3	3	0	0	3	0	0	0	0	0	0	2	2	3	1
IT1222.2	3	3	2	0	3	0	0	2	2	2	0	2	3	2	1
IT1222.3	3	3	3	2	0	2	2	2	3	2	3	2	3	3	3

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	**IT1223**					**Course category**			**PC2**
Course Name	**DISCRETE MATHEMATICS**								
Teaching Scheme				**Examination Scheme**					**Credits**
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
03	--	--	03	30	10	60	02 hrs 30 min	--	--	100	03

COURSE OBJECTIVES

1. Introduce students to the techniques, algorithms, and reasoning processes involved in the study of discrete mathematical structures.
2. Introduce students to set theory, inductive reasoning, elementary and advanced counting techniques, equivalence relations, recurrence relations, graphs, and trees.
3. Express a logic sentence in terms of predicates, quantifiers, and logical connectives.
4. Apply rules of inference, tests for validity, and methods of proof including direct and indirect proof forms, proof by contradiction, proof by cases, and mathematical induction and write proofs using symbolic logic and Boolean Algebra.
5. Determine if a given graph is simple or a multigraph, directed or undirected, cyclic or acyclic, and determine the connectivity of a graph.

Set Theory , Logic and Proofs : Propositions, Conditional Propositions, Logical Connectivity, Propositional calculus, First order logic, Proofs: Proof Techniques, Mathematical Induction. Set, Combination of sets, Principle of inclusion and exclusion , strong Induction .

Relations, Functions, Recurrence Relations: Definitions, Properties of Binary Relations, Equivalence Relations and partitions, Partial ordering relations and lattices, Chains and Anti chains. Theorem on chain, Recurrence relations. Functions: Definition, Domain, Range, Image, etc. Types of functions: Surjection, Injection, Bijection, Inverse, Identity, Composition of Functions.

Number Theory: Basics of Modulo Arithmetic, Basic Prime Number Theory, GCD, LCM, Divisibility, Euclid's algorithm, Factorization, Chinese Remainder Theorem Fields: Naturals, Integers, Rationals, Reals, Complex Numbers Properties of operations: associative, commutative, distributive, identity, inverse .

Counting Basic Counting Techniques (sum, product, subtraction, division, exponent): Pigeonhole and Generalized Pigeonhole Principle with many examples, Permutations and Combinations and numerical problems,Identity and Triangle, Generating Permutations and Combinations

Graphs & Trees Basic terminology:multi graphs and weighted graphs, paths and circuits, shortest path Problems, Euler and Hamiltonian paths and circuits, factors of a graph, planar graph, independent sets, graph coloring. Trees, rooted trees, path length in rooted trees, binary search trees, spanning trees and cut set, theorems on spanning trees, cut sets , circuits, minimal spanning trees, Kruskal's and Prim's algorithms for minimal spanning tree.

Algebraic Systems: Algebraic Systems, Groups, Semi Groups, Monoids, Subgroups, Permutation Groups, Codes and Group codes, Isomorphism and Automorphisms, Homomorphism and Normal Subgroups, Ring, Field.

Text Books

1. C. L. LIU, "Elements of Discrete Mathematics", 2nd Edition, Tata McGraw-Hill, 2002, ISBN: 0-07- 043476-X.
2. G. Shanker Rao, "Discrete Mathematical Structures", New Age International, 2002, ISBN: 81-224-1424-9 Reference Books:
3. Lipschutz, Lipson, Discrete Mathematics, 2nd Edition, Tata McGraw-Hill, 1999, ISBN 0-07-463710--X.
4. V. K. Balakrishnan, Graph Theory, TMH (Recommended for Graph), ISBN 0-07-058718-3
5. B. Kolman, R. Busby and S. Ross, "Discrete Mathematical Structures", 4th Edition, Pearson Education, 2002, ISBN 81-7808-556-9
6. J. Tremblay, R. Manohar, "Discrete Mathematical Structures with application to Computer

Science", McGraw-Hill, 2002 ISBN 0-07-065142-6 (Recommended for prepositional Calculus).

7. Kenneth H. Rosen: Discrete Mathematics and Its Applications, 5th Edition, Tata McGraw-Hill, 2003, ISBN 0-07-053047-5.

Course Outcomes

Students will be able to:

IT1223.1 Explain basic terminology, formal logic, proofs, sets, relations, functions, recursion

IT1223.2 Use formal logic proof and logical reasoning to solve problems

IT1223.3 Relate the ideas of mathematical induction to recursion and recursively defined structures

IT1223.4 Solve problems based on graphs, trees and related algorithms

IT1223.5 Relate, interpret and apply the concepts to various areas of computer science

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IT1223.1	2	3	1	0	0	0	0	0	0	0	0	1	2	3	1
IT1223.2	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
IT1201.3	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
IT1201.4	3	3	3	0	0	0	0	0	0	0	0	1	3	3	1
IT1201.5	1	3	2	0	0	0	0	0	0	0	0	1	3	3	1

1- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Curriculum Structure for B. Tech. Instrumentation Engineering Programme

(In light of NEP 2020)

NCrF Level 6

(NEP_Version II)

For students admitted in 2023-24 onwards

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

Near Kathora Naka, Amravati, Maharashtra
PIN 444604
www.gcoea.ac.in

Sign
Member Secretary

Sign
BoS Chairperson

Sign
Dean, Academics

Sign
Principal

Structure for B. Tech. Programme in light of NEP 2020

For students admitted in 2023-24 onwards

Key Features of Curriculum

1. Multiple entry and exit option after every year.
2. Provision for Open Electives (OE), Vocational and Skill Enhancement Courses (VSE), Ability Enhancement Courses (AE), Indian Knowledge System (IKS), Value Education Courses (VE), Co-Curricular Courses (CC) in addition to program core courses.
3. Mandatory internship of one semester.
4. Credits for Value education courses, Ability Enhancement Courses, Co-Curricular Curricular Activities.
5. Mandatory Non-Credit Courses.
6. Interdisciplinary and multidisciplinary education through single and double minors and open electives.
7. Skill based courses and multiple exit level.
8. Provision for learning in online mode through Swayam/ NPTEL etc courses
9. Provision for B.Tech. Honours with Research degree through research project.
10. Opportunity for learner to choose courses of their interest in all disciplines.
11. Provision of Skill Based Courses and internship/Field project/mini projects for exit options at each level.
12. Flexibility for all types of learners i.e. Good, Normal and Exit

Good Students	Normal Students	Exit
B. Tech. Major with Multidisciplinary Minor	B. Tech. Major with Multidisciplinary Minor	Additional 08 credits in the form of skill-based courses / labs, internship, mini projects shall be offered in 8 weeks.
B. Tech. Honors and Multidisciplinary Minor	--	
B. Tech. Honors with Research and Multidisciplinary Minor	--	
B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	--	

Credit Distribution for each year and Exit Option

NCrFLevel	Year / Semester	Exit Option	Credits	Additional Credits for exit students	Total Credits
4.5	Semester I & II	U. G. Certificate	43	08	51
5.0	Semester III & IV	U. G. Diploma	82	08	90
5.5	Semester V & VI	B. Vocational/B.Sc. Engg.	127	08	135
6.0	Semester VII & VIII	B. Tech.Major with Multidisciplinary Minor	167	--	167
		B. Tech. Honors and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. Honors with Research and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	167+18=185	--	185

Course Category-wise Credit Distribution

Course Category	As per NEP GR	GCOEA Credits	CC	As per NEP GR	GCOEA Credits
BSC/ESC	30	30	BS	14-18	18
			ES	16--12	12
Program Courses	64-76	**67**	PC	44-56	**47**
			PE	20	20
Multidisciplinary Courses	22	22	MM	14	14
			OE	8	8
Skill Courses	8	8	VSE	8	8
Humanities, Social Science & Management (HSSM)	14	14	AE	4	4
			EM	4	4
			IKS	2	2
			VE	4	4
Experiential Courses	22	22	RM	4	4
			FP	2	2
			PR	4	4
			IN/OJT	12	12
Liberal Learning Courses	4	4	CC	4	4
Total Credits	**164-176**	**167**		**164-176**	**167**

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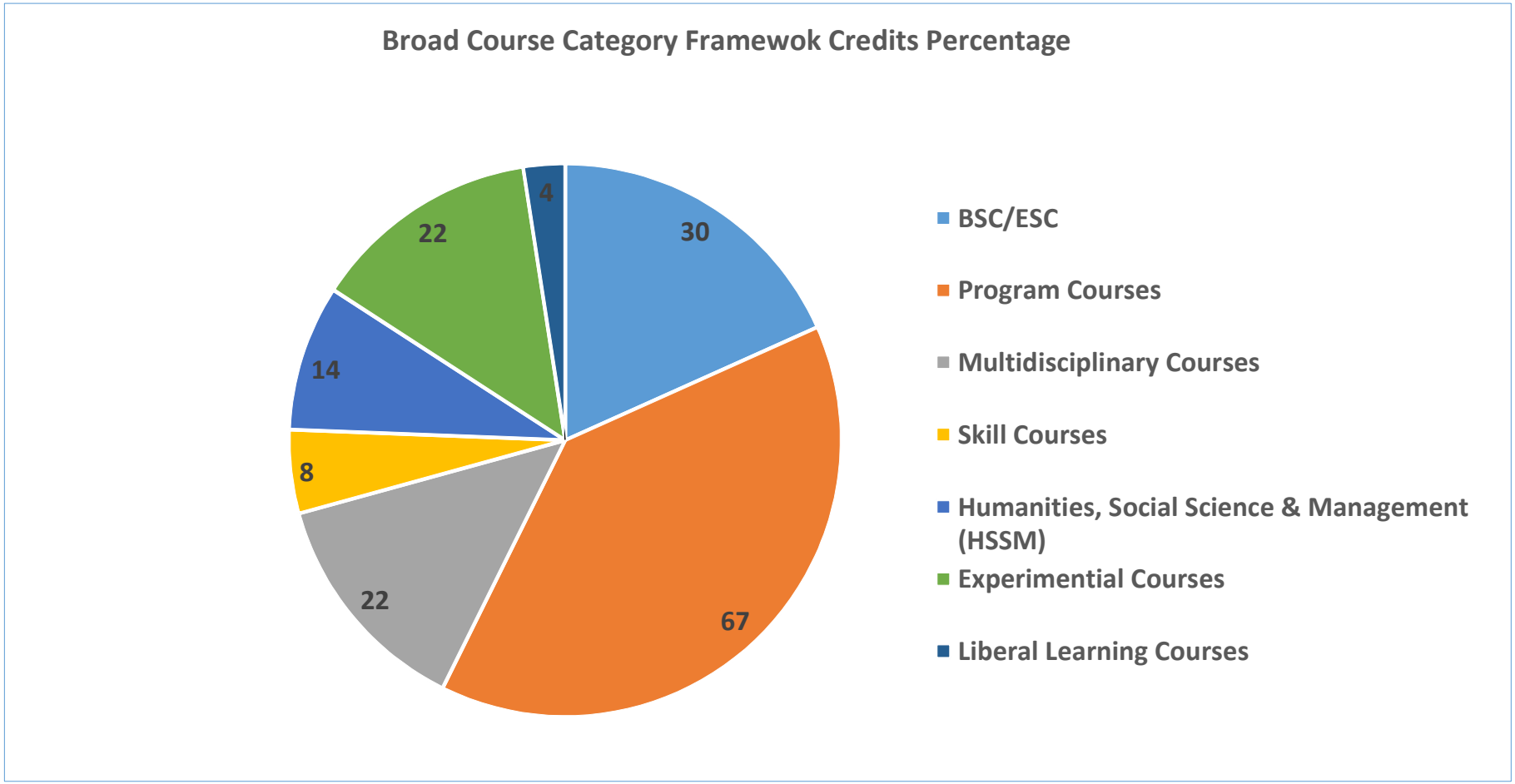
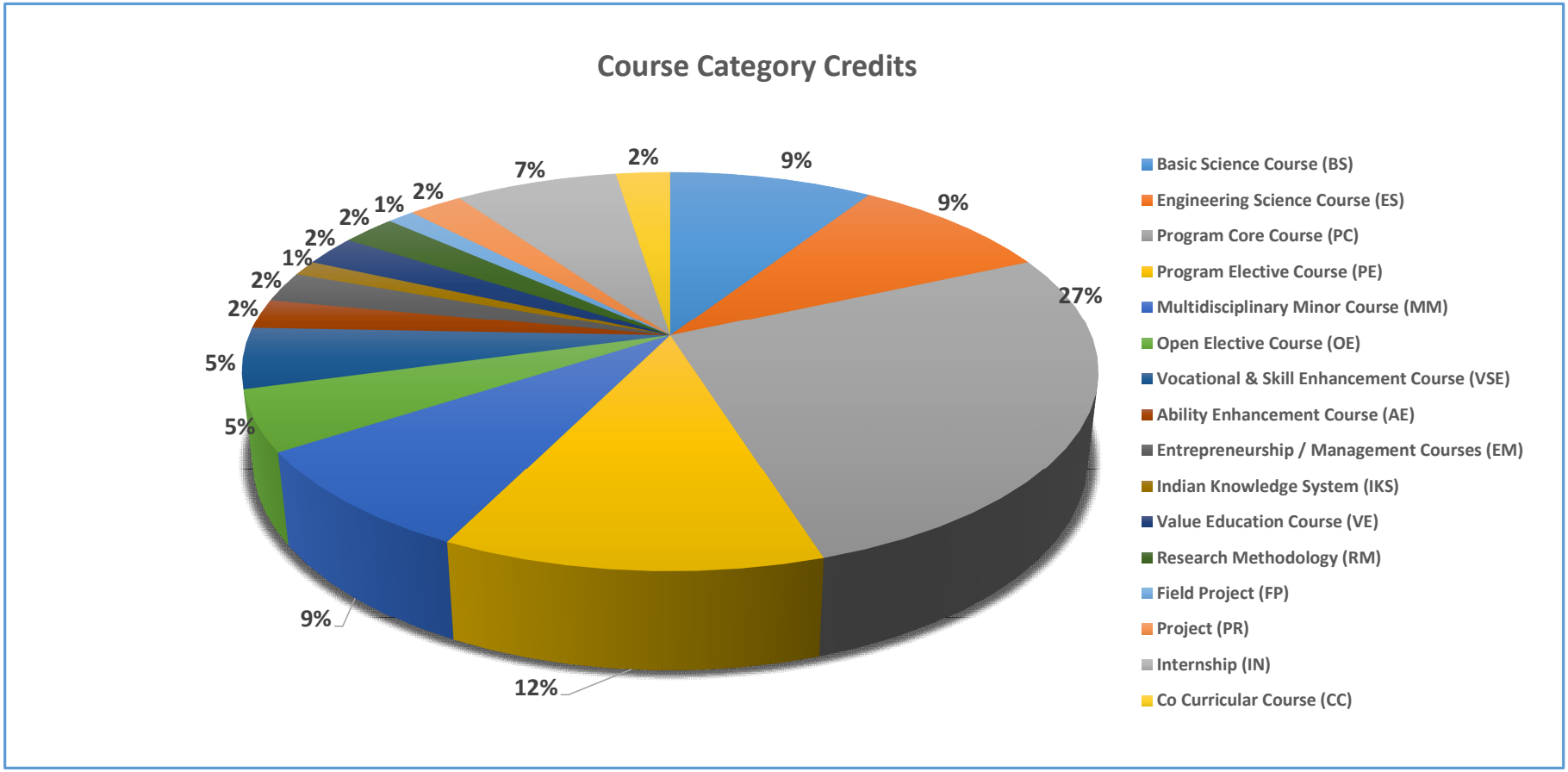

Broad Course Category Framewok Credits Percentage
30
67
22
8
14
22
4
BSC/ESC
Program Courses
Multidisciplinary Courses
Skill Courses
Humanities, Social Science & Management (HSSM)
Experimental Courses
Liberal Learning Courses



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Semester-wise Credit Distribution

Sr. No.	SEM	I	II	III	IV	V	VI	VII	VIII	Total Credits	NEP Requirement
1	Basic Science Course (BS)	8	7	3						18	14-18
2	Engineering Science Course (ES)	8	4							12	12-16
3	Program Core Course (PC)		6	**10**	**11**	**10**	**7**	**3**		**47**	44-56
4	Program Elective Course (PE)					4	8	8		20	20
5	Multidisciplinary Minor Course (MM)			3	3	3	3	2		14	14
6	Open Elective Course (OE)				3	3		2		8	8
7	Vocational & Skill Enhancement Course (VSE)			2	1	2	1	2		8	8
8	Ability Enhancement Course (AE)	1	3							4	4
9	Entrepreneurship / Management Courses (EM)			1					3	4	4
10	Indian Knowledge System (IKS)	2								2	2
11	Value Education Course (VE)	2	2							4	4
12	Research Methodology (RM)								4	4	4
13	Field Project (FP)						2			2	2
14	Project (PR)							4		4	4
15	Internship (IN)								12	12	12
16	Co Curricular Course (CC)				2	2				4	4
	Total Credits	**21**	**22**	**19**	**20**	**24**	**21**	**21**	**19**	167	164-176

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General Instructions:

(1) 10% content of syllabus of each theory course shall be completed bythe students with self-study. The 10% portion of each course (for self-study) shall be declared by theconcerned course-coordinator at the beginning of teaching of the course.

(2) Student can complete **any Course** or programme elective coursesPE1 to PE5 in "online" mode, offered through SWAYAM/ NPTELportal or equivalent platform which provides Evaluation mechanismwith the permission of Departmental Faculty Board (DFB). In this case –

(i) Students can register and complete these online courses any time after beginning of third semester, however, the student must successfully complete and pass the course, and submit the score card/certificate before declaration of result of respective semester in which the course is being offered.

(ii) In case, if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute in respective semester as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the course, and successfully complete the course.

(3) In eighth semester, the students have to complete mandatory internship of one semester in the company/ organization approved by the DFB.

(4) In eighth semester during internship, thestudents have to complete the theory courses in any one of the two modes:

(i) **Online courses** offered through SWAYAM/ NPTELor equivalent platform which provides Evaluation mechanismwith the permission of DFB: In this case, students can register and complete these online courses any time after beginning of third semester and complete the course and submit the score card/ certificate before declaration of result of eighth semester.

In case if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the coursepersonally as per the schedule declared by the institute, and successfully complete the course.

(ii) **Self-study mode:** In this case the student will have to study the course offered by the institute of his/her own. The student shall appear for all the college assessments/ examinations (CT1/CT2, TA and ESE) personally as per the schedule declared by the instituteand successfully complete the course.

(5) In addition to program specific courses, the students have to complete vocational skill courses, internship, field projects connected to **major degree**.

(6) Exit Option:

The exit option at the end of each year will be available to students after even semester. e. 2nd semester, 4th semester &6th semester and will commence from AY 2024-25 for UG Certificate, AY 2025-26 forUG Diploma, AY 2026-27 for B. Voc./B. Sc. Engineering degree.

(7) Students opting for exit at any level (after odd semesters or even semester) will have to earn additional eight credits before exit in skill based vocational courses and internship/apprenticeship/mini project to make them eligible to get UG certificate / UG Diploma or B. Voc./B. Sc. Engineering degree as per eligibility.

(8) Re Entry and Lateral Entry: Students opting for exit at any level after even semester, will have the option to re-enter the programme from where they left off in odd semesters within **four years of exit.**There shall be a gap of at least **one year**between exit and re-entry to UG programme.

(9) Students opting for exit after odd semester, i.e. 1st, 3rd, 5th or 7th semester will have the option to re-enter the programme from where they left off in even semesters only.There shall be a gap of at least **one year**between exit and re-entry to UG programme.

(10) Maximum period for completion of B. Tech. programme:

The student has to complete the degree programme within the stipulated **maximum period of eight years** from the date of admission to first year UG. The maximum duration of the programme includes the period of exit, withdrawal, absence and different kinds of leaves permissible to a student but it shall exclude the period of rustication of the student from the institute. However, genuine cases on confirmation of valid reasons may be referred to Academic Council for extending this limit by **additional one year**.

(11) Eligibility for admission to the UG Bachelor's Degree with Honours/ Research/Double Minor:

Students with minimum **CGPA of 7.5** without backlog courses at the end of fourth semester and should have earned 84**credits** are eligible for admission to the UG Bachelor's Degree with Honours/ Research/ Double Minor.

SEMESTER –I														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
		Induction Program	TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
BS1	SH1121	Engineering Mathematics-I	3	1		4	15	15	10	60			100	4
BS2	SH1122	Engineering Physics	3			3	15	15	10	60			100	3
	SH1123	Engineering Physics Laboratory			2	2					25		25	1
ES1	EE1121	Basic Electrical Engineering	3			3	15	15	10	60			100	3
	EE1122	Basic Electrical Engineering Laboratory			2	2					25		25	1
ES2	CS1121	Programming for Problem Solving	2			2	15	15	10	60			100	2
	CS1122	Programming for Problem Solving Laboratory			2	2					25		25	1
ES3	ME1121	Workshop Practices			2	2					25		25	1
AE1	SH1124	Communication Skill			2	2	0	0			50		50	1
VE1	SH1125	Environment Science	2			2	15	15	20				50	2
IKS1	SH1126	Indian Knowledge System	2			2			40				40	2
Total			**15**	**1**	**10**	**26**	**75**	**75**	**100**	**240**	**150**		**640**	**21**

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SEMESTER –II														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT-1	CT-2	TA	ESE	ICA	ESE		
BS3	SH1221	Engineering Mathematics-II	3	1		**4**	15	15	10	60			100	4
BS4	SH1222	Engineering Chemistry	2			2	15	15	10	60			100	2
	SH1223	Engineering Chemistry Laboratory			2	2					25		25	1
ES4	ME1221	Engineering Graphics	2			2	15	15	10	60			100	2
	ME1222	Engineering Graphics Laboratory			2	2					25		25	1
PC1	**IN1221**	**Elements of Measurement**	3			3	15	15	10	60			100	3
ES5	**IN1222**	**Elements of Measurement Laboratory**			2	2					25		25	1
PC2	**IN1223**	**Introduction to Matlab**	2	1		3	15	15	10	60			100	3
AE2	SH1224	Modern Indian Language		2		2	15	15	20				50	2
VE2	SH1225	Universal Human Value	2			2	15	15	20				50	2
MNC1	SH1226	Yoga &Fitness			2	2			20				20	0
AE3	SH1227	Language Laboratory			2	2					25		25	1
			14	**4**	**10**	**28**	**105**	**105**	**110**	**300**	**100**		**720**	**22**

Note : In first semester , the students of Civil, Electrical, Electronics & Telecommunication ,Instrumentation Engineering programmes will be offered the courses mentioned under Semester-I**AND** students of Mechanical , Computer Science Engineering and Information Technology will be offered the courses mentioned under Semester-II and in Second Semester Vice-versa except Engineering Mathematics-I (SH1101) and Engineering Mathematics-II (SH1201).

Equivalence Scheme

Programme Name:-B. Tech. Instrumentation Engineering

S r	Course code with Name of course(old)						Course code with Name of course(NEW) (NEP Version-II)		
	Revised Curriculum 2019-20			NEP Version I					
	Code	Name	Credit	Code	Name	Credit	Code	Name	Credit
1	INU322	EM &Instrumentation	3	IN1215	Elements of Measurement	2	IN 1221	Elements of Measurement	3
2	INU325	EM &Instrumentation Lab	1	IN1216	Elements of Measurement Lab	1	IN1222	Elements of Measurement Lab	1

Multiple exits: Following options are available for multiple exists:

Option	NCrF Level	Qualification Title	Additional credit requirement	Bridge courses
Exit-1	4.5	One year UG certificate course in Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at ITI Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project
Exit-2	5.0	Two year UG Diploma I Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at Diploma Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project
Exit-3	5.5	Three year Bachelor Degree in Vocation (B.Voc) orB.Sc. (Engg./Tech)	8	2 Month Internship **OR** Online Two skill courses at Degree Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR**Technical Project

EXIT CRITERIA FOR U. G. Certificate														
Category	Course Code	Name of the Course @	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT1	CT 2	TA	ESE	ICA	ESE		
EX1	IN1211	Industrial Instrumentation	4			4				100				4
EX1	IN1212	Industrial Instrumentation Lab **AND**			4	4					25		50	4
		Technical Project/Programming Language									25			
OR														
EX1	IN1213	**Internship / Technical Project**									100@		100	8

@ Based on seminar, Internship Report, Internship/ Project evaluation

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SEMESTER –I

CourseCode	IN1221								Course category			PC
CourseName	ELEMENTS OF MEASUREMENT											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESEDuration	ICA	ESE		
03	--	--	03	15	15	10	60	2 hrs30 min	--	--	100	03

Course Objectives:

To make the students aware and understand:

I. The course intends provide an overview and understand the internal structure of various types of Measuring Instruments & its operation.

II. To study basic CRO in measurement of voltage and frequency.

III. To use the different meters required for measurement of electric parameters.

IV. To understand the operation of power and energy measurement.

V. To learn the basic AC and DC bridges used for R,L,C measurement.

Course Contents:

Measurements and Errors:

Fundamentals of measurements, methods of measurements, Classification of instruments, Static and Dynamic characteristics of instruments, Errors in measurements,Types of Errors, Limiting Errors, sources of Error, Statistical Analysis.

Oscilloscope :

Block Diagram of Cathod Ray Oscilloscope, Cathod Ray Tube, Basic CRO Cuircuit, vertical deflection system, Horizontal Deflection System and synchronization Amplifier, Observation of Waveform on CRO, CRO probes (Direct, Attenuator and active) measurement of phase angle and frequency, multi-input oscilloscope (Dual beam Oscilloscope, Dual trace oscilloscope)

Analog and digital meters:

Classification of torques deflecting, controlling, damping, D'Arsonval galvanometer, construction, torque equation and dynamic behaviour of galvanometer, PMMC instrument

construction, torque equation and error in PMMC instrument,ohmmeter, DC ammeter, DC voltmeter, multi-range meters, Digital Multi-meter DMM.

Measurement of Power and Energy:

Measurement of Power in DC and AC circuits, Electrodynamic wattmeter instruments: construction, Principle of operation, Induction type Wattmeter (single phase) . Single phase induction type energy meter, theory, error sources and compensation.

AC and DC Bridges:

Introduction of bridges , DC Bridges - Wheatstone bridge, Kelvin bridge, Kelvin double bridge, applications of DC bridges, AC bridges -Maxwell bridge, Hay bridge, Schering bridge, Wien bridge, applications of AC bridges.

Text Books:

1. A. K. Sawhney, "Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai and Sons, Eleventh ed., 2000.
2. H S Kalsi, "Electronic Instrumentation", Tata McGraw-Hill, Third ed., 2010

Reference Books and Websites:

1. U.A bakshi and A.V.Bakshi , "Electrical measurements" ,Technical Publications Pune 1 January 2010
2. Albert D. Helfrick, William David Cooper, "Modern electronic Instrumentation and Measurement Techniques" Prentice Hall, Second ed., 1990
3. Rohit Khurana "Electronic Instrumentation and Measurement"., Vikas publication Pvy Ltd. 2015
4. Electronic Instruments and Instrumentation Technology by Anand M. M. S., PHI
5. J. B. Gupta, Electrical and Electronic Measurements & Instrumentation, S. K. Katariya & Sons, 1969.

Course Outcomes:

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

IN1221.1 : Distinguish the static & dynamic characteristics of an instrument along with their error types

IN1221.2 :Understand basic CRO in measurement of voltage and frequency

IN1221.3 : Use the different meters required for measurement of electric parameters.

IN1221.4 : Define the operation of power and energy measurement.

IN1221.5 : Learn the basic AC and DC bridges used for R,L,C measurement.

CO– PO –PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IN1221.1	2	2	-	-	-	-	-	-	-	1	-	-	2	-	-
IN1221.2	2	2	1	2	--	-	-	-	-	-	-	-	1	-	-
IN1221.3	3	2	1	2	--	-	-	1	-	-	-	-	2	-	1
IN1221.4	3	2	1	-	--	-	1	-	-	-	1	-	2	1	-
IN1221.5	2	1	1	-	1	-	-	-	-	-	-	-	2	-	1
Average	2.4	1.8	1	2	1	0	1	1	0	1	1	0	1.8	1	1

0-Not correlated 1 -Weakly Correlated 2-Moderately Correlated 3-StronglyCorrelated

Course Code	IN1222							Course category		ES
Course Name	ELEMENTS OF MEASUREMENT LABORATORY									
Teaching Scheme				Examination Scheme						Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESEDuration	ICA	ESE		
--	--	02	02	--	--	--	---	25	--	25	01

Course Objectives:

To make the students will be able to:

I. Demonstrate the various types of Measuring Instruments
II. Perform the experiments on electrical machines , bridges and able to draw the conclusion from them.
III. Analyze performance of various analog and digital meters.

Course Contents:

Representative list of experiments related to the course contents of IN1222 (**Elements of Measurement**):

1. Determination of Phase Difference Dual Beam/Trace Method Lissajous Figures Method
2. Measurement of voltage, frequency &phase with the help of CRO
3. Calibration and Testing of single phase energy Meter .
4. Measurement of resistance using multi-range ammeter and multi range Voltmeter
5. Usage of DSO for steady state periodic waveform produced by a function generator. Selection of trigger source and trigger level, selection of time-scale and voltage scale. Bandwidth of measurement and sampling rate.
6. Study of Galvanometer and Determination of Sensitivity and Galvanometer Constants.
7. Design and implementation of resistance measurement using Wheatstone bridge
8. Measurement of Low Resistance using Kelvin's double bridge
9. Measurement of L using a bridge technique as well as LCR meter.
10. Measurement of C using a bridge technique as well as LCR meter.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

IN 1222.1 Make electrical connections and analyze the results obtained.
IN 1222.2 Understand the usage of common electrical measuring instruments

andcomponents.

IN 1222.3 Explain various measurements techniques for industrial and laboratory applications.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IN1222.1	1	1	1	-	-	-	1	1	2	-	-	-	1	1	1
IN1222.2	2	-	-	1	-	-	-	1	1	-	-	1	1	1	1
IN1222.3	2	2	-	1	-	-	-	1	1	-	-	-	-	1	-
Average	1.67	1.5	1	1	0	0	1	1	1.33	0	0	1	1	1	1

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

ICA –Internal Continuous Assessment shall be based on the practical record and knowledge/skills acquired. The performance shall be assessed experiment wise using continuous assessment formats, A and B.

CourseCode	IN1223		PC
CourseName	**Introduction to Mat Lab**		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
2	1	--	3	15	15	10	60	2.30 Hrs	--	--	100	03

Course Objective: Learn the basics of MATLAB® through this introductory tutorial on commonly used features and workflows. Get started with the MATLAB language and environment so that students can analyse science and engineering data.

Course Contents:

I Matlab Commands

Study of the Commands, Name the Variables, Save and Load various Variables, Use of Built-in Functions and Constants in MatLab

II Matlab Desktop and Editor

Learn the environment of MATLAB Desktop and Editor,Study the MATLAB Editor, Run the Scripts, Debug MATLAB Code

III Vectors and Matrices

Manually Enter the Arrays, Create Evenly Spaced Vectors ,Create Arrays with Functions in Matlab

IV Array Indexing and Modification

Indexing, Index into Arrays, Extract Multiple Elements ,Change Values in Arrays in the Matlab

V Function Calls

Study of functions in the Matlab, Request Multiple Outputs in Function Calls, MATLAB Documentation

VII Plot Vectors and Annotate plots

Plot the Vectors, Annotate Plots, Use relational operators and logical indexing to extract

elements of interest from MATLAB arrays.

VIII Programming and Project based on Matlab study

Mini project consist of Programming in MatLab with various functions

Course Outcome

At the end of this course, students will demonstrate the ability to

IN1223.1 Use the Matlab environment for numerous matrix operations
IN1223.2 Interpret and execute the Matlab commands
IN1223.3 Visualize and plot the data in Matlab
IN1223.4 Write simple code in Matlab
IN1223.5 Develop simple applications

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IN1223.1	3	1	--	-	-	-	1	1	--	1	-	-	1	--	1
IN1223.2	3	-	-	1	-	-	-		--	1	-	-	1	--	1
IN1223.3	3	--	-	1	-	-	-	1	--	2	-	-	-	--	-
IN1223.4	3	--	--	--	--	--	--	--	--	2	--	--	1	--	--
IN1223.5	3	--	--	--	--	--	--	--	--	3	--	--	2	--	1
Average	3	1	0	1	0	0	1	1	0	1.8	0	0	1.25	0	1

Note: Students can enrol for the MATLAB ONRAMP COURSE available online on Math works website and submit the certificate. In addition Students must attend the classes as per timetable and appear for the examination.(CT1, CT2, ESE).

Link: https://matlabacademy.mathworks.com/details/matlab-onramp/gettingstarted

Course Code	IN1211	Course category	EX1
Course Name	INDUSTRIALINSTRUMENTATION		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESEDuration	ICA	ESE		
4	--	--	4	---	--	---	100	3.00 Hr	--	--	100	04

Course Objectives:

To make the students aware and understand:

To select and use required sensors for temperature measurement

To derive the working principle and characteristics of pressure transducers.

To apply the appropriate flow sensors in classified applications.

Tochoose the appropriate sensor for different applications like temperature, pressure, level and flow

To understand the basic principles of various smart sensors.

Course Content:

Temperature Measurement:

Introduction,various temperature scales, Expansion thermometers :liquid-in glass thermometers,bimetallic thermometers, Pressurethermometers: Vapourpressurethermometer,liquid filledthermometer, glassfilledthermometer, Electrical resistance thermometer(RTD), thermistors, Thermocouple thermometers: thermoelectric effects, thermocouple, thermocouple material, advantages and limitations of various thermometers

PressureMeasurement: Introduction,various pressure scales, Manometers:Simple manometer, differential manometer,Mechanical gauges: elastic pressure elements, pressure gauges, Electrical pressure transducers: resistive, inductiveand capacitivetype, advantagesand limitations of variouspressuregauges

LevelMeasurement: Methods of level measurement: Direct method: float gauges, sight glass level gauge, Indirect methods:hydrostatic pressure devices, capacitive type level measurement, ultrasonic type level measurement techniques, gammarayliquid level measurement, Comparative assessment of various level sensors

FlowMeasurement:

Essential principles of fluid mechanics and properties off luid, types of fluid flow,continuity equation, Bernoulli' sequation, hydrostatic lawand pascal's law,Selection criteria of flow sensors.HeadType FlowMeter:Orifice,venturi, nozzle,pitottube.Variable Area Type Flow Meter: Rota-meter Open Channel: Turbine, Target, ElectroMagnetic, Ultrasonic, Vortex Shedding, anemometers.Mass FlowMeter:Coriolis,Thermal& solid flow meters

Smart Sensors &its Applications:

Introduction,Definition,BlockDiagramofSmartSensors,DifferencebetweennonsmartSensors&SmartSensors,Smart Transducers, Introduction toInternetof Things(IoT) Sensorsand actuators.

TextBooks:

1. Bentley,J.P., "Principles of measurement systems", 3rd edition, Pearson Education Asiapvt.ltd
2. Rangan,Mani,Sharma,"Instrumentation:Devices and Systems", 2nd edition, McGrawHill, 2017
3. AK.Sawhney,"AcourseinElectricalandElectronicMeasurementsandInstrumentation"

Reference Books and Websites:

1. Murthy,D.V.S.,"Transducers and Instrumentation", Prentice Hall of India Pvt Ltd.
2. Nubert, H.K.P.,"Instruments Transducers",Clarenden Press, Oxford
3. Patranabis,D.,"SensorsandTransducers",WheelerPublishingCo.Ltd, NewDelhi.
4. http://nptel.iitm.ac.in

Course Outcomes:

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

IN1211.1: Select and use required sensor for temperature measurement
IN1211.2: Derive the working principle and characteristics of pressure transducers.
IN1211.3: Apply the appropriate flow sensors in classified applications.
IN1211.4: Choose the appropriate f sensor for different applications like temperature, pressure,level and flow.
IN1211.5: Understandthebasicprinciplesofvarioussmartsensors

CO– PO –PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IN1211.1	2	2	-	-	-	-	-	-	-	1	-	-	2	-	1
IN1211.2	2	2	1	-	--	-	-	-	-	-	-	-	1	-	-
IN1211.3	3	2	1	-	--	-	-	1	-	-	-	-	2	1	1
IN1211.4	3	2	1	-	-	-	1	-	-	-	1	-	2	1	-
IN1211.5	2	1	-	-	-	-	-	-	-	2	-	-	2	1	1
Average	2.4	1.8	1	0	0	0	1	1	0	1.5	1	0	1.8	1	1

0-Not correlated 1 -Weakly Correlated2-ModeratelyCorrelated3-StronglyCorrelated

Course Code	IN1212						Course category		EX1
Course Name	INDUSTRIAL INSTRUMENTATION LAB & TECHNICAL PROJECT / PROGRAMMING LANGUAGE								
Teaching Scheme				Examination Scheme					Credits
Th	Tu	Pr	Total	Theory				Practical	Total		
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
--	--	4	4	--	--	--	--	---	50	--	50	04

Course Objectives:

To make the students will be able to:

I. Perform the experiments on various transducers and able to draw the conclusion from them

II. Make the students aware of basic concepts of measurement and operation f different type s of transducers.

III. Construct the connection diagram for plotting the characteristics of given sensor/transducer

Course Contents:

Representative list of experiments related to the course contents of I N1212

(Industrial Instrumentation) out of the many eight experiments can be perform.

1. To study the characteristics of Resistance Temperature Detector.
2. To study the characteristics of Thermocouple.
3. Characteristics of diaphragm type pressure transducer.
4. Level measurement using ultrasonic transducer.
5. Level measurement using capacitive transducer.
6. Flow measurement using Rotameter and orifice plate
7. Design and Test Air purge probe for Level Measurement
8. Study of Smart sensors

Course Outcomes:

At the end of this course , students will demonstrate the ability to

IN1212.1 Perform the experiments on various transducers and able to draw the conclusion from them

IN1212.2 Make the students aware of basic concept s of measurement and operation of different types of transducers.

IN1212.3Construct the connection diagram for plotting the characteristics of given sensor/transducer

Along with the Lab either Technical Project based on the Industrial Lab knowledge will be completed or Programming language can be studied by the student from online resources and produce the complete ion certificate for completion of the course

CO– PO –PSOMapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
IN1212.1	1	1	1	-	-	-	1	1	2	-	-	-	1	1	1
IN1212.2	2	-	-	1	-	-	-	1	1	-	-	1	1	1	1
IN1212.3	2	2	-	1	-	-	-	1	1	-	-	-	-	1	-
Average	1.67	1.5	1	1	0	0	1	1	1.33	0	0	1	1	1	1

0-Notcorrelated 1-WeaklyCorrelated2-ModeratelyCorrelated3-StronglyCorrelated

ICA –Internal Continuous Assessment shall be based on the practical record and& Technical Project/Programming Language knowledge /skills acquired. The performance shall be assessed experiment wise using continuous assessment formats,A and B