Kavayitri Bahinabai Chaudhari

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

First Year Engineering

(Common for all)

(As per NEP 2020 Guidelines)

Faculty of Science and Technology

कवयित्री बहिणाबाई चौधरी उत्तर महाराष्ट्र विद्यापीठ

अंतरी पेटवू ज्ञानज्योत

1990

'A' Grade

NAAC Re-Accredited

(4th Cycle)

SYLLABUS STRUCTURE

For Affiliated Colleges

Semester – I & II

W.E.F. 2024 – 25

Objectives of the Program:

1. To provide a holistic and multidisciplinary technical education that develops all capacities of human beings – intellectual, aesthetic, social, physical, emotional, ethical, and moral – in an integrated manner.
2. To enrich students with new knowledge and skills to engage meaningfully in the emerging socio-economic transformation.
3. To prepare professionals in cutting-edge areas that are fast gaining prominence with important applications to health, environment, and sustainable living for enhancing employability of the youth.

Program Outcomes (POs) for an engineering graduate:

i. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

ii. **Problem Analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

iii. **Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

iv. **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems.

v. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern
engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

vi. **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

vii. **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

viii. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

ix. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

x. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

xi. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

xii. **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Abbreviations:

AEC: Ability Enhancement Courses
CC: Co-curricular Courses
CEP: Community engagement project
ELC: Experiential Learning Courses
FP: Field projects
HSSM: Humanities, Social Science, and Management
IKS: Indian Knowledge System
LL: Liberal Learning Courses
MPCC: Minor Program Core Courses
OE: Generic/ Open Electives
OJT: On Job Training: Internship/ Apprenticeship
RM: Research Methodology
RP: Research Project
SEC: Skill Enhancement Courses
VEC: Value Education Courses
VSC: Vocational Skill Courses
VSEC: Vocational Skill and Skill Enhancement Courses

Semester wise Credit distribution structure for Four Year UG Engineering Program with Multidisciplinary Minor:

	Semester	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Total Credits**
Basic Science Course	BSC/ESC	08	08							16
Engineering Science Course		08	04							12
Programme Core Course (PCC)	Program Courses		04	10	10	13	13	04	04	58
Programme Elective Course (PEC)						04	04	03	06	17
Multidisciplinary Minor (MD M)	Multidisciplinary Courses			02	02	02	02	02	02	12
Open Elective (OE) Other than a particular program				03	03	02				08
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	01	01		01		02			05
Ability Enhancement Course (AEC)	Humanities Social Science and Management (HSSM)	02			01					03
Entrepreneurship/Economics/ Management Courses				02	02					04
Indian Knowledge System (IKS)			02							02
Value Education Course (VEC)				02	02					04

Research Methodology	Experiential Learning Courses								04	04
Community Engagement Project (CEP)/Field Project (FP)				02						02
Project									05	05
Internship/ OJT								12		12
Co-curricular Courses (CC)	Liberal Learning Courses	02	02							04
Total Credits (Major)		**21**	**21**	**21**	**21**	**21**	**21**	**21**	**21**	**168**

Under Bachelor's Engg./ Tech. Honours Degree in chosen Major Engg./ Tech. Discipline with Multidisciplinary Minor (Multidisciplinary and Honors, 180-194 credits), students would take up five-six additional courses of 18 to 20 credits in the same Engg./ Tech. discipline/ Emerging Areas Specialization distributed over semesters III to VIII. Students will have to compulsorily choose Honors from the same faculty / discipline.

Under Bachelor's Engg./ Tech. Degree in chosen Major Engg./ Tech. Discipline with Double Minor (Multidisciplinary and Specialization Minor, 180-194 credits), students would take up five-six additional courses of 18 to 20 credits in another Engg./ Tech. discipline/ Emerging Areas Specialization distributed over semesters III to VIII. Students will have to compulsorily choose Minor from other faculty / discipline.

Students will have the flexibility to enter a programme in odd semesters and exit a programme after the successful completion of even semesters as per their future career needs. Students exiting will be awarded provided they secure additional EIGHT credits in skill-based vocational courses.

The credit structure for different levels under the Four-year Bachelor's Multidisciplinary Engineering UG Programme with multiple entry and multiple exit options are as given below**:**

Level	Qualification Title	Credit Requirements	Semester	Year
4.5	One Year UG Certificate in Engg./ Tech.	42	2	1
5.0	Two Years UG Diploma in Engg./ Tech.	84	4	2
5.5	Three Years Bachelor's Degree in Vocation (B. Voc.) or B. Sc. (Engg./ Tech.)	126	6	3
6.0	4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg./ Tech. with Multidisciplinary Minor	168	8	4

PROGRAM / BRANCH CODE (XX):
CH: CHEMICAL ENGINEERING
CE: CIVIL ENGINEERING
CS: COMPUTER ENGINEERING
EC: ELCTRONICS & TELECOMMUNICATION ENGINEERING
EE: ELECTRICAL ENGINEERING
ME: MECHANICAL ENGINEERING
AI: ARTIFICIAL INTELLIGENCE
AIML: ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

Syllabus Structure for First Year Engineering (Semester – I, Level – 4.5) (Computer, Electrical, AI, AIML) (w.e.f. 2024 – 25)
(As per NEP 2020 Guidelines)

Course Code	Name of the Course	Category	Teaching Scheme				Evaluation Scheme					Credits
							Theory		Practical		Total	
			Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE (CA)	ESE (UA)	ICA (CA)	ESE (UA)		
CS-101	Engineering Physics	BSC	3			3	40	60			100	3
CS-102	Engineering Physics-Lab	BSC			2	2			25	-	25	1
CS -103	Engineering Mathematics – I	BSC	3	1	-	4	40	60		-	100	4
CS -104	Basic Electrical and Electronics Engineering	ESC	3			3	40	60			100	3
CS -105	Basic Electrical and Electronics Engineering - Lab	ESC			2	2			25	25 (OR)	50	1
CS -106	Programming for Problem Solving	ESC	3	-		3	40	60			100	3
CS -107	Programming for Problem Solving Lab	ESC			2	2			25	25 (PR)	50	1
CS -108	Workshop Practices Lab	VSEC	-		2	2			25	25 (OR)	50	1
CS -109	English	AEC	1		2	3			25		25	2
CS -110	Co-curricular Course	CC (LL)	1		2	3			50		50	2
			14	**1**	**12**	**27**	**160**	**240**	**175**	**75**	**650**	**21**

Note: 3-week long Induction Program for students entering the institution must be conducted right at the start.

ISE: Internal Sessional Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

CA: College Assessment UA: University Assessment

Syllabus Structure for First Year Engineering (Semester – I, Level – 4.5) (E & TC, Mechanical, Civil, Chemical) (w.e.f. 2024 – 25)
(As per NEP 2020 Guidelines)

Course Code	Name of the Course	Category	Teaching Scheme				Evaluation Scheme					Credits
							Theory		Practical		Total	
			Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE (CA)	ESE (UA)	ICA (CA)	ESE (UA)		
CH -101	Engineering Chemistry	BSC	3			3	40	60			100	3
CH -102	Engineering Chemistry Lab	BSC			2	2			25	-	25	1
CH -103	Engineering Mathematics – I	BSC	3	1	-	4	40	60		-	100	4
CH -104	Engineering Graphics	ESC	3			3	40	60			100	3
CH -105	Engineering Graphics Lab	ESC			2	2			25	25 (OR)	50	1
CH -106	Programming for Problem Solving	ESC	3	-		3	40	60			100	3
CH -107	Programming for Problem Solving Lab	ESC			2	2			25	25 (PR)	50	1
CH -108	Soft Skills Lab	VSEC	-		2	2			25	25 (OR)	50	1
CH -109	Introduction to Indian Knowledge System	IKS	1		2	3			25		25	2
CH -110	Co-curricular Course	CC (LL)	1		2	3			50		50	2
			14	**1**	**12**	**27**	**160**	**240**	**175**	**75**	**650**	**21**

Note: 3-week long Induction Program for students entering the institution must be conducted right at the start.

ISE: Internal Sessional Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

CA: College Assessment UA: University Assessment

Syllabus Structure for First Year Engineering (Semester – II, Level – 4.5) (Computer, Electrical, AI, AIML) (w.e.f. 2024 – 25)
(As per NEP 2020 Guidelines)

Course Code	Name of the Course	Category	Teaching Scheme				Evaluation Scheme					Credits
							Theory		Practical		Total	
			Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE (CA)	ESE (UA)	ICA (CA)	ESE (UA)		
CS -201	Engineering Chemistry	BSC	3			3	40	60			100	3
CS -202	Engineering Chemistry-Lab	BSC			2	2			25	-	25	1
CS -203	Engineering Mathematics - II	BSC	3	1	-	4	40	60		-	100	4
CS -204	Engineering Graphics	ESC	3			3	40	60			100	3
CS -205	Engineering Graphics-Lab	ESC			2	2			25	25 (OR)	50	1
CS -206	Introduction to Artificial Intelligence and Machine Learning	PCC	3	-		3	40	60			100	3
CS -207	Introduction to Artificial Intelligence and Machine Learning-Lab	PCC			2	2			25	25 (PR)	50	1
CS -208	Soft Skills Lab	VSEC	-		2	2			25	25 (OR)	50	1
CS -209	Introduction to Indian Knowledge System	IKS	1		2	3			25		25	2
CS -210	Liberal Learning Course	CC (LL)	1		2	3			50		50	2
			14	**1**	**12**	**27**	**160**	**240**	**175**	**75**	**650**	**21**

ISE: Internal Sessional Examination ESE: End Semester Examination ICA: Internal Continuous Assessment
CA: College Assessment UA: University Assessment

EXIT COURSE FOR U. G. CERTIFICATE in relevant Discipline /Subject (DURATION 8 WEEKS)

Course Code	Name of the Course	Category	Teaching Scheme				Evaluation Scheme					Credits
							Theory		Practical		Total	
			Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE (CA)	ESE (UA)	ICA (CA)	ESE (UA)		
XX-208	Internship / Apprenticeship*	OJT							125			4
XX-209	Mini Project*	VSEC / Project							25			4
									150			8

* Branch specific

Syllabus Structure for First Year Engineering (Semester – II, Level – 4.5) (E & TC, Mechanical, Civil, Chemical) (w.e.f. 2024 – 25)
(As per NEP 2020 Guidelines)

Course Code	Name of the Course	Category	Teaching Scheme				Evaluation Scheme					Credits
							Theory		Practical		Total	
			Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE (CA)	ESE (UA)	ICA (CA)	ESE (UA)		
CH-201	Engineering Physics	BSC	3			3	40	60			100	3
CH-202	Engineering Physics Lab	BSC			2	2			25	-	25	1
CH -203	Engineering Mathematics - II	BSC	3	1	-	4	40	60		-	100	4
CH -204	Basic Electrical and Electronics Engineering	ESC	3			3	40	60			100	3
CH -205	Basic Electrical and Electronics Engineering Lab	ESC			2	2			25	25 (OR)	50	1
CH -206	Introduction to Artificial Intelligence and Machine Learning	PCC	3	-		3	40	60			100	3
CH -207	Introduction to Artificial Intelligence and Machine Learning Lab	PCC			2	2			25	25 (OR)	50	1
CH -208	Workshop Practices Lab	VSEC	-		2	2			25	25 (OR)	50	1
CH -209	English	AEC	1		2	3			25		25	2
CH -210	Liberal Learning Course	CC (LL)	1		2	3			50		50	2
			14	**1**	**12**	**27**	**160**	**240**	**175**	**75**	**650**	**21**

ISE: Internal Sessional Examination ESE: End Semester Examination ICA: Internal Continuous Assessment
CA: College Assessment UA: University Assessment

EXIT COURSE FOR U. G. CERTIFICATE in relevant Discipline /Subject (DURATION 8 WEEKS)

Course Code	Name of the Course	Category	Teaching Scheme				Evaluation Scheme					Credits
							Theory		Practical		Total	
			Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE (CA)	ESE (UA)	ICA (CA)	ESE (UA)		
XX-208	Internship / Apprenticeship*	OJT							125			4
XX-209	Mini Project*	VSEC / Project							25			4
									150			8

* Branch specific

Kavayitri Bahinabai Chaudhari

NORTH MAHARASHTRA

UNIVERSITY, JALGAON (M.S.)

First Year Engineering
(Common for all)
(As per NEP 2020 Guidelines)

Faculty of Science and Technology

'A' Grade
NAAC Re-Accredited
(4th Cycle)

COURSE OUTLINE
For Affiliated Colleges
Semester – I & II
W.E.F. 2024 – 25

ENGINEERING PHYSICS					
COURSE OUTLINE					
Course Title:	**ENGINEERING PHYSICS**	**Short Title:**	PHY	**Course Code:**	

Course description:
Explore laws, forces, and matter properties while studying the motion of charges in electric and magnetic fields. Hands-on demonstrations reinforce theoretical concepts, enhancing problem-solving skills and preparing students for diverse industry opportunities. Gain practical insights and unlock a world of career possibilities in this dynamic physics course.

	Hours/week	**No. of weeks**	**Total hours**	**Semester credits**
Theory	03	14	42	04
Practical	02	14	28	

Prerequisite course(s):
Mathematics course with vector calculus

Course objectives:
The objective of this course is to:
1. Cultivate practical problem-solving abilities in real-world physics scenario.
2. Foster critical thinking for analytical evaluation of complex phenomena.
3. Promote interdisciplinary thinking by integrating varied physics concepts.

Course outcomes:
After successful completion of this course the student will be able to:
1. Demonstrate deep comprehension of diverse physics principles and applications.
2. Exhibit advanced proficiency in solving diverse physics problems.
3. Critical analysis of experimental data, literature, and theoretical models.
4. Apply integrated physics knowledge to solve real-world challenges effectively.
5. Communicate scientific ideas persuasively through clear reports and presentations.

COURSE CONTENT

ENGINEERING PHYSICS		**Semester:**	**I or II**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End Semester Exam (ESE) UA:**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exam (ISE) CA:	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Optics, X-ray and Laser

Interference, Diffraction and Polarization (comparative study) Principle of optical fiber, acceptance angle, acceptance cone, numerical aperture, Numerical. Continuous & Characteristics Spectrum of X-ray, Bragg's law, X-ray diffraction, Properties & Applications of X-Rays, Numerical. Principle of laser, Properties of laser beams: Types of laser – He-Ne laser

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Introduction to Mechanics &Acoustics

Scalars and vectors properties, Newton's laws and its completeness in describing particle motion, Conservative and non-conservative forces, Central forces, Keplars law without derivation, Ultrasonic waves, Production of Ultrasonic wave by Magnetostriction & Piezoelectric Method, Properties & Applications of Ultrasonic wave.

Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**

Quantum Mechanics& Nanoscience

Matter waves, Properties of Matter wave, De-Broglie hypothesis, Heisenberg's Uncertainty principle, Schrödinger Time dependent and Time independent wave equation.
Nano particle, Top down & Bottom-up approach, Properties of Nano particles, Synthesis of Nanoparticles (Physical, Chemical & Hybrid)

Unit–IV:	**No. of Lectures: 09 Hours**	**Marks: 12**

Magnetic Materials, Semiconductors and Superconductors

Magnetic Materials (Comparative study), B-H Curve, Types of Semiconductors, Conductivity in semiconductor, Hall effect, Numerical, Superconductivity, Properties of Superconductor, Meissner effect, Types of superconductors, applications.

Unit–V:	**No. of Lectures: 09 Hours**	**Marks: 12**

Electromagnetic Theory

Divergence, Curl and Gradient, Electric flux, Gauss Law, Calculation of electric field, Poisson's & Laplace equation and Calculation of electrostatic potential for a charge distribution, Biot-Savarts Law, Amperes Law, Faradays Law, Lenz Law for Electromagnetic equations, Applications of Classical Mechanics, Quantum Mechanics &Electrodynamic with Python.

Text Books:

1. "A Textbook of Engineering Physics" by M N Avadhanulu and P G Kshirsagar, S.Chand Publishing
2. "Engineering Physics" by Rajendran V, MGH Publishing
3. "Engineering Physics" by Dattuprasad Joshi, Tata McGraw Hill Education Publishing

Reference Books:

1. A Textbook of Optics - Brij Lal, M.N. Avadhanulu, and N.Subrahmanyam, S Chand Publishing
2. Introduction to Mechanics — MK Verma, CRC Press
3. Solid State Physics – S. O. Pillai, M. A. Wahab, A.J. Dekker, Charles Kittel, Narosa Publishing
4. Introduction to Electromagnetic Theory - David Griffiths, Pearson Education Publishing
5. Quantum mechanics - Richard Robinett, Oxford University Press.
6. Concept of Modern Physics – Arthur Beizer, McGraw Hill Publishing
7. Optics – Ajoy Ghatak, McGraw Hill Publishing

NPTEL Links:

1. Semiconductors by Prof. S.K. Gupta, https://www.nptelvideos.com/lecture.php?id=1314.
2. Stationary waves and Diffraction by Prof. Rajdeep Chatterjee, Prof. B. K. Patra, Prof. M. K. Srivastava, Prof. G.D. Verma, https://www.nptelvideos.com/lecture.php?id=1113
3. Quantum Physics and Heisenberg principal by Prof. V. Balakrishnan, https://www.nptelvideos.com/lecture.php?id=1523
4. Difference between Classical and Quantum by Prof. V. Balakrishnan, https://www.nptelvideos.com/lecture.php?id=1528
5. Newtonians Mechanics by Prof. V. Balakrishnan, https://www.nptelvideos.com/lecture.php?id=989
6. Superconductors by Prof. S.K. Gupta, https://www.nptelvideos.com/lecture.php?id=1312

ENGINEERING PHYSICS LAB		
LAB COURSE CONTENT		
ENGINEERING PHYSICS LAB	**Semester:**	**I or II**

Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**Internal Continuous Assessment (ICA) CA:**	**25 marks**

Concerned faculty member should suitably frame EIGHT laboratory assignments from the following list.

1. Analyze the Determination of wavelength of He-Ne laser light and its implications in precision measurements.
2. Evaluate the experimental verification of Law of Malus and its significance in optics research.
3. Analyze the data from the Determination of 'e/m' of electron experiment to understand subatomic particle properties.
4. Evaluate the Study of Crystal Plane using models and assess their application in material science.
5. Analyze the Determination of Hall Coefficient data to understand the behavior of charge carriers in a magnetic field.
6. Analyze the results from Determination of resistivity of semiconductor and draw conclusions about conductivity and material properties.
7. Evaluate the Measurement of Band gap energy of Semiconductors and its implications for electronic devices.
8. Evaluate the Study of I-V characteristics of Solar cell and assess its efficiency in harnessing solar energy.
9. Analyze Semiconductor diode characteristics to understand their application in electronic circuits.
10. Evaluate the effectiveness of Fiber optics communication in high-speed data transfer applications.
11. Analyze the data from Ultrasonic Detectors to understand their applications.
12. Analyze the results from the study of B-H Curve to understand magnetic material behavior.
13. Evaluate the Measurement of Susceptibility data and its significance in magnetic material characterization.
14. Analyze the data from Experiments on electromagnetic induction and electromagnetic breaking to understand electromagnetic phenomena.
15. Evaluate the Magnetic field generated from Helmholtz coil and its applications in experimental setups.
16. Design and conduct an Experiment Related to Nanoscience and Nanotechnology, integrating multiple concepts to explore innovative applications.
17. Develop Python solutions for Physics Problems in Classical Mechanics, Quantum Mechanics & Electrodynamics, applying programming skills to solve complex physics problems.

Text Books:

1. "A Textbook of Engineering Physics" by M N Avadhanulu and P G Kshirsagar
2. "Engineering Physics" by Rajendran V
3. "Engineering Physics" by Dattuprasad Joshi

NPTEL Links:

1. Thomson experiment to determine the specific charge of an electron (e/m) by Prof. Amal Kumar Das
2. Frank-Hertz experiment by Prof. Amal Kumar Das

https:/nptel.ac.in/courses/115105120

Guide lines for ICA:

Students must submit ICA in the form of journal. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignment.

ENGINEERING CHEMISTRY

COURSE OUT LINE

Course Title:	ENGINEERING CHEMISTRY	Short Title: CHY	Course Code:

Course description:

This course is aimed at introducing the fundamentals of basic sciences (Chemistry) to under graduate students. The background expected includes a prior knowledge of chemistry from HSC (science) and familiarity with basic fundamental theories. The goals of the course are to understand the basic Principles of Chemistry and their applications in different branches of engineering.

	Hours/week	No. of weeks	Total hours	Semester credits
Theory	03	14	42	04
Practical	02	14	28	

Prerequisite course(s):

11^{th} & 12^{th} Chemistry

Course objectives:

1. To learn the significance of water treatment and different methods of softening hard water
2. The participants acquire knowledge about the applications of electrochemistry in the fields of fuel cells, batteries, electrolytic processes and electrochemical corrosion & spectroscopy.
3. To impart the awareness of various fuels
4. This course aims to provide a good platform to engineering students to understand, model and appreciate concept of thermodynamics.
5. To enhance the overall awareness of the synthesis, properties & applications of various polymers

Course outcomes:

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

1. Apply the different methodologies for analysis of water and techniques involved in softening of water as commodity.
2. Acquire the knowledge of electrodes in electrochemical cells, migration of ions, liquid junction potential and conductometric titrations
3. Acquire the knowledge of conventional and alternative fuels with respect to their properties and applications.
4. Identify and formulate fundamentals laws of thermodynamics.
5. Understand structure, properties and applications of polymers and nano material.

COURSE CONTENT

ENGINEERING CHEMISTRY		Semester:	I or II
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exam (ISE):	**40 marks**

Unit–I:	No. of Lectures: 08 Hours	Marks: 12

Water Technology

Impurities in water, hardness of water, its types, Units and numerical on hardness determination. Determination of hardness by EDTA, alkalinity, effects of hard water in boiler - priming and foaming, boiler corrosion, caustic embrittlement, scale and sludge.

Water treatment: i) Zeolite method ii) Demineralization method.

Unit–II:	No. of Lectures: 08 Hours	Marks: 12

Electrochemistry

Introduction: Electric conduction, types of conductors, Metallic conduction: Electrolytic or ionic conduction, Electrolytes & their classification, Electrical conductance of solution, Conductivity Cell & Cell constant, Types of electrochemical cells, Salt bridge & its function, Cell potential, Introduction of spectroscopy and its applications, introduction UV, IR & NMR, fluorescence & its applications, applications of MRI.

Unit–III:	No. of Lectures: 09 Hours	Marks: 12

Fuels

Introduction (definition, classification of fuel. characteristics of an ideal fuels.
Calorific value (CV): Higher calorific value (HCV) and Lower calorific value (LCV),
Determination of Calorific value by Bomb calorimeter and Boy's gas calorimeter and numerical,
Solid fuel: Coal: Analysis of Coal-Proximate and Ultimate analysis.
Liquid fuel: Petroleum: Refining of petroleum /crude oil and composition, boiling range
Gaseous fuel: Composition, properties and applications of CNG.
Alternative fuels: Power alcohol and biodiesel.

Unit–IV:	No. of Lectures: 09 Hours	Marks: 12

Thermodynamics

Introduction: Terms used in thermodynamics, System and surrounding, Extensive property & Intensive property, Process and its types, Expression for pressure-volume (PV) work, Expression for the maximum work: first law of thermodynamics & its limitations, spontaneous and non-spontaneous process with examples, Statements of second law of thermodynamics, Definition of Entropy, Statement of third law of thermodynamics, its applications.

Unit–V:	No. of Lectures: 08 Hours	Marks: 12

Polymers

Introduction, Classification of polymers, Mechanism of addition polymerization by free radical method. Preparation, properties & applications of – Polyethylene, Polystyrene, PVC, Nylon 66, Teflon.
Synthetic Rubber – preparation, properties & applications of Styrene butadiene rubber (SBR), Nitrile rubber, Butyl rubber.

Text Books:

1. Textbook of Engineering Chemistry by Dr. S. S. Dara, Dr. S. S. Umare, (S. Chand & Company Ltd.)
2. Textbook of Engineering Chemistry by Dr. Sunita Rattan, (S. K. Kataria& Sons Publisher)
3. A Textbook of Engineering Chemistry by Shashi Chawla (Dhanpat Rai & Co.)
4. A Textbook of Engineering Chemistry by S Chand (S. Chand & Company Ltd.)

Reference Books:

1. B.H. Mahan University chemistry, (Publisher: Pearson)
2. M.J.Sienkoand R.A.Plane,Chemistry: Principles and Applications, (Publisher: McGraw Hill Higher Education.)
3. C. N. Banwell,Fundamentals of Molecular Spectroscopy, (Publisher: Mcgraw Higher Ed.)
4. P. W. Atkins,Physical Chemistry, (Publisher: Oxford University Press))
5. J.D. LeeConciseInorganicChemistry, (Publisher: Oxford University Press)
6. Puri,Sharma,Kalia,Principlesof InorganicChemistry (Publisher: Vishal Publishing & Co.)
7. Polymer Science, V. R. Gowarikar, N. V. Viswanathan, jayadevSreedhar, Wiley Eastern Limited (Publisher: New Age International Private Limited)
8. Engineering Chemistry by O .G. Palanna, (Publisher: Tata Magraw Hill Education Pvt. Ltd. Engineering Chemistry, Wiley India Pvt. Ltd.)

NPTEL Links:

1. Electrochemistry by Prof. Angshuman Roy Choudhury, https://archive.nptel.ac.in/courses/104/106/104106137/#

2. Basic concepts of thermodynamics by Prof. Dipankar N. Basu https://nptel.ac.in/courses/112103275
3. Polymerisation by Abhijit Deshpande, https://archive.nptel.ac.in/courses/103/105/103105219/

ENGINEERING CHEMISTRY LAB			
LAB COURSE CONTENT			
ENGINEERING CHEMISTRY LAB		**Semester:**	**I or II**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**Internal Continuous Assessment (ICA) CA:**	**25 marks**

Concerned faculty member should suitably frame EIGHT laboratory assignments from the following list.

1. To determine hardness of water by EDTA method.
2. To determine alkalinity of water.
3. To determine strength of strong acid using pH meter.
4. To perform titration of a mixture of weak acid and strong acid with strong base using conductometer
5. Preparation of polystyrene/phenol-formaldehyde/urea-formaldehyde resin
6. To conduct Proximate analysis of coal.
7. Determination of cell constant and conductance of solutions.
8. Determination of acid value of an oil.
9. To conduct chemical analysis of a salt.
10. Determination of chloride content of water.
11. To determine coefficient of viscosity using Ostwald viscometer.
12. Determination of surface tension of liquids.

Text Books

1. Tembe, Kamaluddin and Krishnan, Engineering Chemistry (NPTELWeb-book)
2. Dara, S.S.; A text book on Experiments and Calculations in Engineering Chemistry (ninth edition); (Publisher S. Chand)

Reference Books:

1. B.D. Khosla, A. Gulati and V.Garg, Senior Practical Physical Chemistry, (R. Chand & Co., Delhi)
2. K. K. Sharma and D.S. Sharma, An Introduction to Practical Chemistry, (Publisher: Vikas publishing, New Delhi)
3. Laboratory Manual on Engineering Chemistry, Sudharani (Dhanpat Rai Publishing Company).
4. Engineering chemistry practical book by Malviya A Jaspal D (Publisher: Narosa Publishing House Pvt. Ltd. - New Delhi)

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in Charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignment.

ENGINEERING MATHEMATICS-I					
COURSE OUTLINE					
Course Title:	**Engineering Mathematics –I**	**Short Title:**	**M-I**	**Course Code:**	

Course description: This course is aimed at introducing the fundamentals of basic Mathematics to undergraduate students. The background expected includes a prior knowledge of Mathematics from 12th science and familiarity with various laws, principles and theories. The goals of the course are to understand the basic principle of Mathematics and its application in different area.

	Hours/week	**No. of weeks**	**Total hours**	**Semester credits**
Theory	3	14	42	4
Tutorial	1	14	14	

Prerequisite course(s): 11th & 12th mathematics

Course objectives:

The objective of this course is to familiarize the prospective engineers with techniques in calculus, linear algebra and statistics and probability. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their discipline

Course outcomes:

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

1. Deal with functions of several variables that are essential in most branches of Engineering. The essential tool of matrices and linear algebra in a comprehensive manner.
2. Apply differential and integral calculus. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.
3. Understand basic concept of statistics, probability distribution. Apply statistical methods for analyzing experimental data.
4. To learn approach for modeling the relationship in two variables.
5. To understand the basic concept of partial differentiation and apply it to solve in engineering problems

COURSE CONTENT

Engineering Mathematics -I		**Semester:**	**I**
Teaching Scheme:		**Examination scheme:**	
Lectures:	**3 hours/week**	**End semester exam (ESE) UA:**	**60 marks**
Tutorial:	**1 hour/week**	**Duration of ESE:**	**03 hours**
		Internal Sessional Exams (ISE) CA:	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**

Matrices: Introduction to rank of a matrix, System of linear equations, Symmetric and orthogonal matrices, Eigen values and Eigen vectors, Application of matrices (Rotation)

Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**

Differential and Integral Calculus: Taylor's and Maclaurin's theorem, Gamma function, Beta function, Application of Taylor's Theorem

Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**

Basics Statistics and Probability: Measure of Central Tendency, Standard Deviation, Coefficient of Variation, Basic probability, Binomial, Poisson and Normal distributions.

Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**

Correlation and Regression: Lines of Regression, Coefficient of Regression, Correlation and Coefficient of Correlation.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Partial Differentiation: Partial derivatives, Euler's theorem, Composite functions, Jacobians (only Definition and JJ′=1), Errors and approximations.		
Text Books:		
1. H. K. DASS "Advance Engineering Mathematics" S. Chand publications.		
Reference Books:		
1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010,2016. 2. Debashis Datta "Textbook of Engineering Mathematics'' New Age International Publication. Revised second edition. 3. "Engineering Mathematics A Tutorial Approach". Ravish R..Singh, Mukul Bhatt.Tata McGraw Hill Education Private Limited .New Delhi. 4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010		
NPTEL Links:		
1. Probability and Probability Distributions, By Dr. P. Nagesh, https://onlinecourses.swayam2.ac.in/cec24_ma04/preview 2. Engineering Mathematics – I by Prof. Jitendra Kumar, https://onlinecourses.nptel.ac.in/noc23_ma88/preview 3. Probability and Statistics by Prof. Somesh Kumar https://onlinecourses.nptel.ac.in/noc23_ma83/preview 4. 'System of Linear Equations, Eigenvalues and Eigenvectors' - Mathematics (IIT Kharagpur) Video Lectures by Dr. P. Panigrahi, Prof. J. Kumar, Prof. P.D. Srivastava, Prof. Somesh Kumar (nptelvideos.com) 5. 'Probability Distributions' - Mathematics (IIT Kharagpur) Video Lectures by Prof. Somesh Kumar (nptelvideos.com) 6. 'Probability and Statistics' Video Lectures from IIT Kharagpur by Prof. Somesh Kumar - Mathematics NPTEL Video Lectures (nptelvideos.com)		

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE OUTLINE

Course Title:	**Basic Electrical and Electronics Engineering**	**Short Title:**	**BEEE**	**Course Code:**	

Course description:

This course provides an introduction to electrical and electronics engineering which includes response of electrical circuits to DC as well as AC, semiconductor devices such as diodes, transistors, logic gates and Number Systems.

	Hours/week	**No. of weeks**	**Total hours**	**Semester credits**
Theory	03	14	42	04
Practical	02	14	28	

Prerequisite course(s):

11^{th} & 12^{th} Physics

Course objectives:

1. To explain basic laws and theorems of electrical networks
2. To explain fundamentals of alternating current circuits.
3. To explain students the essential basics of Magnetic Circuits and PN Junction Diode.
4. To explain the concepts and terminology of transistors.
5. To explain logic gates & Number conversion Systems.

Course outcomes:

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

1. Demonstrate & develop basics of DC analysis of electrical circuits using circuit simplification techniques.
2. Demonstrate & develop basics of AC analysis of electrical circuits using series combination of R, L & C.
3. Develop basic principles of magnetic circuits & Semiconductor Diodes.
4. Demonstrate & develop basic configurations of Transistors.
5. Demonstrate different Logic gates and Conversion between the Number Systems

COURSE CONTENT

Basic Electrical and Electronics Engineering		**Semester:**	**I or II**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**

DC Circuit:

Ohms Law, Kirchhoff's laws, Node voltage and Mesh current analysis, Series and Parallel circuit, Current and Voltage division rule, Delta -Star and Star-Delta conversion, Thevenin's Theorem, Superposition Theorem, Maximum Power Transfer Theorem. (Numerical Expected on above topics)

Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**

AC Circuit:

Single phase AC Circuits: Concept of single-phase supply, Terms related with A.C. quantities, complex and phasor representation of AC quantities, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC series combinations (Numerical expected). Three phase AC Circuit: Concept of Three phase supply, Relation of voltage and current in three phase circuit.

Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**

Magnetic Circuit & PN Junction Diode:
Electromagnetic Induction: Faraday's laws, Lenz's Law, statically and dynamically induced EMF (Numerical should not be asked) Self and Mutual inductance, Terms related with magnetic circuits (Numerical should not be asked) Composite Magnetic Circuit,
PN Junction Diode: V-I Characteristics, Junction break down, Diode current equation, & diode resistances, Temperature dependency of PN Junction Diode, LED working, Photo diode working.

Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**

Transistors:
Bipolar Junction Transistors: Bipolar Junction Transistor (BJT): CB, CE and CC Configurations, DC current gains and their relations (Numerical may be asked) different regions of operations, CE & CB Characteristics, Need of biasing, Voltage Divider Biasing, BJT as an Amplifier.
Field Effect Transistor: Classification, working and V-I Characteristics of JFET, Parameters of FET and Difference between BJT & JFET.

Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**

Logic Gates & Number System:
Number System (Decimal, Binary, Octal, Hexadecimal) & their Conversions, Basic and Universal Logic gates, Boolean Algebra, De-Morgans theorem, Simplification and Implementation of logic equations.

Text Books:

1. B. L. Theraja and A. K. Theraja, "A Text book of Electrical Technology - Vol-I and Vol-II", S. Chand, 1st Edition, 2001.
2. K. A. Krishnamurty, M. R. Raghuveer, "Electrical and Electronics Engineering for Scientists and Engineers," Willey Eastern Limited.
3. J. B. Gupta, "A Course in Electrical Power", S. K. Kataria and Sons, 12th Edition, 2002.
4. R. S. Sedha, "Applied Electronics", S. Chand Publication 5. V.K. Mehta, "Principles of Electronics", S. Chand Publications

Reference Books:

1. D. C. Kulshreshtha, "Basic Electrical Engineering" , 1st Edition (Tata McGraw hill),2009
2. B. L. Theraja and A. K. Theraja S. Chand & Co. Pvt. Ltd. New Delhi, "A textbook of Electrical Technology Vol II",2020P.
3. R. L. Boylestad, L. Nashelsky, "Electronic Devices and Circuits Theory", 11th Edition, Prentice Hall of India, 2017
4. R. P. Jain, "Modern Digital Electronics" McGraw Hill Education (India) Private Limited, Fourth Edition, 2017.
5. A.P. Malvino, "Electronics Principles" TMH Publications

NPTEL Links:

1. Basic Electrical Technology by Prof. L. Umanand, https://nptel.ac.in/courses/108108076
2. Introduction to Basic Electronics by Prof. T.S. Natarajan, https://nptel.ac.in/courses/122106025
3. Fundamentals of Electrical Engineering by Prof. L. Umanand, https://nptel.ac.in/courses/108108076

<table>
<tr><th colspan="4">BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB</th></tr>
<tr><th colspan="4">LAB COURSE CONTENT</th></tr>
<tr><td colspan="2">Basic Electrical and Electronics Engineering Lab</td><td>Semester:</td><td>I or II</td></tr>
<tr><td colspan="2">Teaching Scheme:</td><td colspan="2">Examination scheme</td></tr>
<tr><td>Practical:</td><td>2 hours/week</td><td>End semester exam (ESE): OR</td><td>25 marks</td></tr>
<tr><td colspan="2"></td><td>Internal Continuous Assessment (ICA):</td><td>25 marks</td></tr>
<tr><td colspan="2">End Semester Exam (ESE) Pattern:</td><td colspan="2">Oral (OR)</td></tr>
<tr><td colspan="4">Concerned faculty member should suitably frame FOUR laboratory assignments from each group in the following list.

Group A
1. To demonstrate different electrical and electronics components & equipment.
2. To demonstrate Thevenin’s theorem.
3. To demonstrate Superposition theorem.
4. To demonstrate Maximum power transfer theorem.
5. To demonstrate behavior of R-L series circuits.
Group B
6. To demonstrate V-I characteristics of P-N Junction diode.
7. To demonstrate the V-I characteristics of Light Emitting Diode (LED).
8. To demonstrate the Q-point of BJT.
9. To demonstrate the truth tables of Basic Logic Gates.
10. To demonstrate implementation of Logical equation.</td></tr>
<tr><td colspan="4">Guide lines for ICA:</td></tr>
<tr><td colspan="4">Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignment.</td></tr>
<tr><td colspan="4">Guidelines for ESE:</td></tr>
<tr><td colspan="4">ESE will be based on practical assignment submitted by the student in the form of journal. Evaluation will be based on oral, paper work and performance in the ESE.</td></tr>
<tr><td colspan="4">NPTEL Links:
Introduction to Basic Electronics by Prof. T.S. Natarajan, https://nptel.ac.in/courses/122106025</td></tr>
</table>

ENGINEERING GRAPHICS					
COURSE OUTLINE					
Course Title:	**Engineering Graphics**	**Short Title:**	EG	**Course Code:**	

Course description:

Engineering Graphics is the language of engineers. This course provides a strong foundation in the creation, interpretation, and communication of engineering drawings and diagrams. This preliminary course aims at building a foundation for the further course in drawing and other allied subjects. This subject is useful in developing drafting and sketching skills of students. Through a combination of theoretical learning and hands-on exercises, students will develop the skills necessary to visually represent complex engineering concepts and designs accurately.

	Hours/week	**No. of weeks**	**Total hours**	**Semester credits**
Theory	03	14	42	04
Practical	02	14	28	

Prerequisite course(s):

Basic reasoning skill, Concept of geometry and Basic drafting skills

Course objectives:

The objective of this course is to:
1. To understand techniques of drawings in various fields of engineering.
2. Learn basic engineering drawing formats.
3. To improve imagination skills.
4. Ability to convey complex technical information through drawings and annotations effectively.

Course outcomes:

After successful completion of this course the student will be able to:
1. Apply the concept of industry-standard drawing practices, including line types, symbols, and conventions used in engineering drawings.
2. Corelate the concept of projection of points, straight lines and planes.
3. Acquire visualization skills, which involve creating multiple views of an object to represent it accurately in two dimensions.
4. Illustrate the concept of isometric and 3D drawings to represent objects in a more realistic and visually informative manner.
5. Demonstrate and analyze the understanding of the development of surfaces of different types.

COURSE CONTENT

Engineering Graphics		**Semester:**	**I or II**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE) UA:**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE) CA:	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Introduction:

A) Principles of Engineering Graphics and their significance, usage of Drawing Instruments and Supporting Material, Letters and Numbers as per BIS: SP46-2003.
B) Scale (Plane, Diagonal & Vernier scale).
C) Curves and Conic Section draw Ellipse by arc of circle method. Draw Parabola by rectangle method. Draw Hyperbola by directrix focus method.

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Projection of Lines and Planes:		
A) Projections of straight lines: - Principle of Orthographic Projections, Projections of Points, Projection of Line and Lines inclined to both the Planes. B) Projections of planes: - Projection of different simple shapes e.g. Circle, Triangle, Rectangle, Pentagon and Hexagon on principle plane (Inclined to one plane).		
Unit–III:	**No. of Lectures: 09 Hours**	**Marks: 12**
Orthographic Projections:		
Method of obtaining Orthographic Projections in First angle and Third angle projections, Principles of orthographic projections.		
Unit–IV:	**No. of Lectures: 9 Hours**	**Marks: 12**
Isometric Projections:		
Principles of Isometric Projections, Isometric Scale, Terminology, Isometric view of step, inclined, oblique, cylindrical blocks, Isometric Dimensioning.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Development of Surfaces:		
Methods of development, Parallel line development of cylinder and prism, Radial line development of cone and pyramid.		
Text Books:		
1. Venugopal K and Prabhu Raja V (2015), "Engineering Graphics", New AGE International Publishers. 2. Narayana, K. L& P Kannaiah (2008), Text book on "Engineering Drawing. SciTech Publication.		
Reference Books:		
1. N.D. Bhat and V.M. Panchal, Engineering Graphics, Charotar Publishers 2013 2. Agrawal B &Agrawal B.C (2008) Engineering Graphics, TMH Publication.		
NPTEL Links: 1. Engineering Graphics and Design by IIT Delhi, https://archive.nptel.ac.in/courses/112/102/112102304/ 2. Engineering Drawing by Prof. P.S. Robi, https://nptel.ac.in/courses/112103019 3. Engineering Graphics by Prof. Naresh Varma Datla, Prof. S. R. Kale, https://onlinecourses.nptel.ac.in/noc21_me128/preview		

ENGINEERING GRAPHICS LAB			
LAB COURSE CONTENT			
Engineering Graphics Lab		**Semester:**	**I or II**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE) UA: OR**	**25 marks**
		Internal Continuous Assessment (ICA) CA:	**25 marks**
End Semester Exam (ESE) Pattern:		**Oral (OR)**	
Concerned faculty member should suitably frame Six laboratory assignments (Drawing Sheets) from the following list. **Sheet No. 01** Construct types of Lines, Dimensioning and Scales (Any two problems of Scale) **Sheet No. 02** Analyze and Construct engineering curves (Any three different curves). **Sheet No.03** Construct the Projections of Lines and Planes (Any two problems on projection of lines and any two problems on projection of plane) **Sheet No.04** Illustration of simple orthographic projection using both First Angle and Third Angle Method (One each).			

Sheet No.05 Illustration of Isometric projection with natural scale and isometric scale (One each) **Sheet No.06** Construct and predict the Development of Surfaces (Any two Problems)
Text Books:
1. Venugopal K and Prabhu Raja V (2015), "Engineering Graphics", New AGE International Publishers. 2. Narayana, K. L& P Kannaiah (2008), Text book on "Engineering Drawing. SciTech Publication.
Reference Books:
1. N.D. Bhat and V.M. Panchal, Engineering Graphics, Charotar Publishers 2013 2. Agrawal B &Agrawal B.C (2008) Engineering Graphics, TMH Publication.
NPTEL Links: 1. Engineering Graphics and Design by IIT Delhi, https://archive.nptel.ac.in/courses/112/102/112102304/ 2. Engineering Drawing by Prof. P.S. Robi, https://nptel.ac.in/courses/112103019 3. Engineering Graphics by Prof. Naresh Varma Datla, Prof. S. R. Kale, https://onlinecourses.nptel.ac.in/noc21_me128/preview
Guide lines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in-charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignment.
Guidelines for ESE:
ESE will be based on practical assignment submitted by the student in the form of journal. Evaluation will be based on oral, paper work and performance in the ESE.

PROGRAMMING FOR PROBLEM SOLVING					
COURSE OUTLINE					
Course Title:	**Programming for Problem Solving**	**Short Title:**	PPS	**Course Code:**	

Course description:

This course provides students with a comprehensive study of the C programming language. This course focuses on introduction to program design and problem solving using the C programming language. Programming topics include control structures, functions, arrays, pointers, and file I/O.

	Hours/week	**No. of weeks**	**Total hours**	**Semester credits**
Theory	03	14	42	04
Practical	02	14	28	

Prerequisite course(s):

Basic Mathematical Concepts, Fundamental Logical Thinking, Basic Quantitative and Logical Aptitude

Course objectives:

The objective of this course is to impart knowledge so that the student will:

1. Learn the fundamentals, structure and syntax of C Language.
2. Apply the concepts of C language to solve logical problems.
3. Apply code reusability with functions and pointers.
4. Demonstrate the sequence of the program and give logical outputs.
5. Construct the program using loops and operators to solve problems.

Course outcomes:

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

1. To develop effective algorithms to solve arithmetic and logical problems
2. To design the code using decision making statements and loop to solve the problem.
3. To analyze the given problem and construct small modules from it.
4. To design program based on concept of array and string
5. To construct the structure for application having data of different data types

COURSE CONTENT

Programming for Problem Solving		**Semester:**	**I**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE) UA:**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE) CA:	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**

Introduction to C: Constants, Variables and Keywords, C Instructions, Data Types in C, Operators in C Language: Arithmetic Operators, Logical Operators, The Conditional Operators, Assignment Operators, Increment and Decrement operator.
Decision Control Instruction: If statement, Multiple Statements within if, The if-else statement, Nested if-else, If-else ladder, Switch Case.

Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**

Loop Control Instruction: loops, the while loop, do while loop, for loop, Multiple Initializations in for Loop, break Statement, continue Statement,
Function: Why use Functions? Passing Values between Functions, Call by Value, Recursion.

Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**

Arrays: What are Arrays? A Simple Program using Array, Array Initialization, Array Elements in Memory, Passing Array Elements to a Function, Multidimensional Array: Two Dimensional Arrays, initializing a Two-Dimensional Array, Memory Map of a Two-Dimensional Array, Passing 2 D Array to a Function.		
Unit–IV:	**No. of Lectures: 8 Hours**	**Marks: 12**
Strings: What are Strings? String declaration, String Initialization, Standard Library String Functions, String operations without string library functions. Structures: Why use Structures? Declaring a Structure, Accessing Structure Elements, How Structure Elements are Stored? Array of Structure.		
Unit–V:	**No. of Lectures: 8 Hours**	**Marks: 12**
An Introduction to Pointers, Pointer Notation, Function and pointer, Pointer to an Array, Pointers and Two-Dimensional Arrays, Array of Pointers, Pointers and Strings.		
Text Books:		
1. Yashavant Kanetkar, Let Us C, BPB Publication, 14th Edition		
Reference Books:		
1. E Balagurusamy, Programming in ANSIC C by, Tata McGraw Hill, 4th Edition 2. K. R. Venugopal and S. R. Prasad, Mastering C, Tata McGraw Hill, 2011, 2nd Edition 3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI, 2nd Edition 4. Paul Deitel and Harvey Deitel, C How to Program, Pearson, 8th Edition 5. R.S. Salaria, Computer concepts and Programming in C, Khanna Publication		
NPTEL Video Links:		
1. Introduction to Programming in C by IIT Kanpur, https://archive.nptel.ac.in/courses/106/104/106104128/ https://nptel.ac.in/courses/106104128 2. Problem Solving through Programming in C by IIT Kanpur, https://archive.nptel.ac.in/courses/106/105/106105171/		

PROGRAMMING FOR PROBLEM SOLVING LAB			
LAB COURSE CONTENT			
Programming for Problem Solving Lab		**Semester:**	**I**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE) UA: PR**	**25 marks**
		Internal Continuous Assessment (ICA) CA:	**25 marks**
End Semester Exam (ESE) Pattern:		**Practical (PR)**	
Concerned faculty member should suitably frame **EIGHT** laboratory assignments in C Language from the following list. 1. Construct the program to accept an integer from user and identify whether the given number is Prime number/Armstrong Number/Palindrome number. 2. Identify the number of days in a month using switch case. 3. Develop the code for conversion of Binary number to Decimal number 4. Determine whether a given year is a leap year or a century year.			

5. Compute the roots of a quadratic equation by accepting the coefficients. Print appropriate messages.
6. Illustrate the concept of loops to compute sum of series.
7. Create a code to read n positive integer and Construct right angled triangle of asterisk (*) of n layers.
8. Apply the call by reference method of function to swap the values of two numbers.
9. Compose program for accepting string and reverse it without using library functions. Display the original and reversed string.
10. Construct functions to implement string operations such as compare, concatenate, string length. Convince the parameter passing techniques.
11. Calculate the sum of all even numbers and all odd numbers in the array and print the larger sum.
12. Develop matrix multiplication program and validate the rules of multiplication.
13. Create a structure to store employee number, Name, Department and Basic salary. Create an array of structure to accept and display the value of 10 employees.

Text Books:

1. Yashavant Kanetkar, Test Your C Skills, BPB Publication ,5th Edition
2.Yashavant Kanetkar, Let Us C, BPB Publication, 14th Edition

Reference Books:

1. E Balagurusamy, Programming in ANSIC C by, Tata McGraw Hill, 4th Edition
2. K. R. Venugopal and S. R. Prasad, Mastering C, Tata McGraw Hill P, 2011, 2nd Edition
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI, 2nd Edition
4. Paul Deitel and Harvey Deitel, C How to Program, Pearson, 8th Edition
5. R.S. Salaria, Computer concepts and Programming in C, Khanna Publication

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignment.

Guidelines for ESE:

ESE will be based on the laboratory assignments submitted by the students in the form of journal. In ESE the student may be asked to perform any one practical. Evaluation will be based on paper work and performance in the practical.

WORKSHOP PRACTICES LAB					
LAB COURSE OUTLINE					
Course Title:	Workshop Practices Lab	**Short Title:**	WPL	**Course Code:**	

Course description:

Workshop practice is the backbone of the real industrial environment which helps to develop and enhance relevant technical hand skills required by the technician working in the various engineering industries and workshops. This course intends to impart basic know-how of various hand tools and their use in different sections of manufacturing.
Irrespective of branch, the use of workshop practices in day to day industrial as well domestic life helps to dissolve the problems.

Practical	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	02	14	28	01

End Semester Exam (ESE) Pattern:	**Oral (OR)**

Prerequisite course(s):

11th Physics, 12th Physics

Course objectives:

The objective of this course is to:
1. To provide exposure to the students with hands on experience on various basic engineering practices in Automobile & Mechanical Engineering
2. To provide exposure to the students with hands on experience on various basic engineering practices in Civil Engineering.
3. To provide exposure to the students with hands on experience on various basic engineering practices in Computer Engineering.
4. To provide exposure to the students with hands on experience on various basic engineering practices in Electrical & Electronics Engineering.
5. To develop skills through hands on experience.

Course outcomes:

Upon successful completion of lab Course, student will be able to:
1. Interpret the traffic signs and symbols and perform emergency maintenance of 2/4 wheeler.
2. Examine and troubleshoot various electrical and electronics components.
3. Prepare components using workshop trades including fitting, carpentry, black smithy, metal joining and lathe shop.
4. Organize the various construction activities at site.
5. Appraise the safety practices on the shop floor.

LAB COURSE CONTENT

Workshop Practices Lab		**Semester:**	**I or II**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE) UA: OR**	**25 marks**
		Internal Continuous Assessment (ICA) CA:	**25 marks**

Concerned faculty member should suitably frame EIGHT laboratory assignments from the list given below as per the following.

I. Any four groups out of following six groups.
II. Any two experiments form each chosen groups.

GROUP - A

1. Analyze a given set of traffic signs and signals and road markings to determine their implications for safe driving.
2. Create a step-by-step guide or manual for wheel removal and replacement, including illustrations or diagrams.
3. Develop a maintenance schedule for gear oil checks and replacements based on the vehicle's usage and manufacturer recommendations and check the level of gear oil in engine of Car.
4. Inspect Carburetor/Fuel injector/Spark plug of motorcycle / scooter.
5. Safety at work place.

GROUP - B

1. Assemble a pipe line as per given drawing using pipes of one inch diameter, pipes of half inch diameter, nipple, reducer, union, valves T, elbow and then dissemble this pipe line.
2. Measure the level difference between any two points.
3. Appraise the area of a built-up space using measuring tape.
4. Analyze the readings and measurements obtained from the water pipe technique to verify that they meet the required specifications.
5. Safety at work place.

GROUP - C

1. Create a detailed maintenance checklist or guide for identifying, cleaning, and assembling computer components, including step-by-step instructions and safety precautions and perform the assembly of components in computer / laptop.
2. Manage a hard disk by performing actions such as partitioning, formatting, and file management.
3. Examine and Install Operating System and essential software.
4. Set up connection of nearby devices & internet in computer / laptop / mobile.
5. Safety at work place.

GROUP - D

1. Create a safety guide or checklist for identifying and connecting phase, neutral, and earth wires in domestic electrical installations, emphasizing best practices and safety measures and perform connection to three pin plugs.
2. Design and making of extension board
3. Create a comprehensive earthing design plan and Practice on installation of earthing system and testing of earthing system.
4. Assess the quality of maintenance work performed and the responsiveness to equipment issues, providing recommendations for improvements or replacements when necessary. (tube light, fans, inverter, battery, etc.)
5. Safety at work place.

GROUP - E

1. Design a simple electronic circuit.

2. Apply knowledge of de-soldering techniques to remove and replace components on an electronics circuit.
3. Demonstrate the correct procedure for testing electronic components using appropriate testing equipment
4. Apply knowledge of sensor functionality to design and configure sensor systems for diverse purposes.
5. Safety at work place.

GROUP - F

1. Develop a male female fitting job with drilling and tapping in Fitting Shop & Practice Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint in carpentry shop.
2. Create an S-hook from a given round rod, by hand forging operation.
3. Prepare a single V butt joint and lap joint of mild steel using arc welding.
4. Develop a component using facing, plane turning, step turning, taper turning, knurling and parting on lathe machine.
5. Safety at work place.

Text Books:

1. AICTE's Prescribed Textbook: Workshop / Manufacturing Practices (with Lab Manual) by Veerana D.K., Khanna Publishing, New Delhi ISBN: 978-93-91505-332
2. Engineering Workshop Practices Laboratory Manual (Mechanical) by Sathish. D, Notion Press, ISBN: 9781645461708, 164546170X
3. A Manual of Laboratory Experiments and Workshop Practice, by B. Somanathan Nair, S.R. Deepa, C. Unni, Dreamtech Press,
4. Computer Hardware & Network Maintenance, Joginder Singh Saini, Jagdeep Singh Saini, Royal Book Depot-Jalandhar
5. Vehicle Maintenance and Garage Practice, Doshi J.A, Prentice Hall India Learning Private Limited
6. Trouble Shooting & Maintenance of Electronic Equipments, K. Sudeep Singh, S.K. Kataria & Sons.
7. Installation Maintenance and Repair of Electrical Machines and Equipments, Madhvi Gupta, S.K. Kataria & Sons.
8. Maintenance Repair of Civil structures, Gupta B L, Standard Publications-Delhi.

Reference Books:

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

5. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.
NPTEL Links:
1. Manufacturing Processes I, by Dr. D. K. Dwivedi, Dr. Inderdeep Singh, Dr. D. B. Karunakar, http://nptel.ac.in/courses/112107145/
Guide lines for ICA:
Students must submit ICA in the form of journal. Each practical should be well documented. Faculty in charge will assess the jobs continuously and grade or mark each job on completion date declared for each practical.
Guidelines for ESE:
ESE will be based on the laboratory assignments submitted by the students in the form of journal. Evaluation will be based on oral, paper work and performance in the ESE.

SOFT SKILLS LAB					
COURSE OUTLINE					
Course Title:	**Soft Skills Lab**	**Short Title:**	**SSL**	**Course Code:**	

Course description:

This course provides students with skills that enable them to fit in at a workplace. It helps to enhance your personality, body language, emotional intelligence, attitude, flexibility, motivation, and manners. This course enables students to understand various issues in personal and professional communication and learn to overcome them.

Practical	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	02	14	28	01

End Semester Exam (ESE) Pattern:	**Oral (OR)**

Prerequisite course(s):

11^{th}, 12^{th} English

Course Objectives:

The objective of this course is:

1. To encourage the all-round development of students by focusing on communication skills and personality development.
2. To expose students to the right attitudinal and behavioral aspects & to build the same through activities.
3. To expose the students to develop time management ability, leadership skills.
4. To enhance critical and reflective thinking through activities.
5. To improve awareness of emotional intelligence and stress management techniques.

Course Outcomes:

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

1. Comprehend thoughts through body language and use it as a tool to understand non-verbal signals for better communication
2. Address the audience effectively and deliver speeches without inhibition
3. Perform commendably in interviews, and in all work environment activities with rationality.
4. Integrate with professional ethics and general & corporate etiquette.
5. Prepare and Present Presentations effectively.

COURSE CONTENT

Soft Skills Lab		**Semester:**	**I or II**
Teaching Scheme:		**Examination scheme**	
Practical	**2 hours/week**	**End semester exam (ESE) UA: OR**	**25 Marks**
		Internal Sessional Exams (ICA):	**25 marks**

Concerned faculty member should suitably frame FIVE assignments in the form of interactive Practice Sessions based on the following modules.

Module 1: Communication Skills and Interpersonal Skills

1.1. Effective verbal communication
1.2. Active listening
1.3. Non-verbal communication (body language, gestures)
1.4. Written communication (emails, reports, and business letters)
1.5. Public speaking

Module 2: Discussions and Debates (Activities based)

2.1. Basics of a Group Discussion
2.2. Group Discussion Models

2.3. Debates – Value and Process
Module 3: Successful Interviews 3.1. Pre-Interview Strategies 3.2. Strategies During the Interview 3.3. Strategies After the Interview 3.4. Mock Interviews
Module 4: Professionalism 4.1. Business etiquette and professional behavior 4.2. Resume writing and interview skills 4.3. Negotiation techniques and strategies
Module 5: Effective Presentations 4.1. Formulas and Advanced Techniques of Presentations 4.2. How to overcome the fear factor. 4.3. E-Presentations
Text Books:
1. Stephen Robbins & Judge Timothy: Organization Behavior, Pearson Education
Reference Books:
1. Allan and Barbara Pease, "A Definitive Book on Body Language", Publication Bantam Books. 2. K. Aswathappa – Organizational Behavior: Text, cases & games, Himalaya Publishing House. 3. Indrajit Bhattacharya, ―An Approach to Communication Skills, Delhi, Dhanpat Rai, 2008. 4. Krishnaswami, N. and Sriraman, T, ―Creative English for Communication, Macmillan. 5. Sanjay Kumar and Pushpa Lata, ―Communication Skills, Oxford University Press, ISBN 10:9780199457069. 6.Frank Paolo, "How to Make a Great Presentation in 2 Hours", Pustak Mahal. 7. Simon Sweeney, ―English for Business Communication, Cambridge University Press, ISBN 13:978-0521754507. 8. Goleman, Daniel. Emotional Intelligence. Random House Publishing Group, 2006. 9. Patterson, Kerry, et al. Crucial Conversations Tools for Talking When Stakes Are High, Second Edition. McGraw-Hill Education, 2012. 10. Zander, Rosamund Stone, and Benjamin Zander. The Art of Possibility: Transforming Professional and Personal Life. Penguin Publishing Group, 2002.
NPTEL Links:
1. Soft Skills by Prof. Binod Mishra, IIT Roorkee, https://nptel.ac.in/courses/109107121 2. Soft Skill Development by Prof. P. Patnaik, Prof. V.N. Giri, Prof. D. Suar, IIT Kharagpur, https://nptel.ac.in/courses/109105110
Guide lines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on the completion date declared for each assignment.
Guidelines for ESE:
ESE will be based on the practice assignments submitted by the students in the form of journal. Evaluation will be based on oral, paper work and performance in the ESE.

ENGLISH					
COURSE OUTLINE					
Course Title:	**English**	**Short Title:**	**ENG**	**Course Code:**	

Course description:

This course has been designed to pay special attention to contemporary industrial needs and current and society demands for Communicative Language skills.

	Hours/week	No. of weeks	Total hours	Semester credits
Theory	01	14	14	2
Practical	02	14	28	

Prerequisite course(s):

11th & 12th English

Course Objectives:

1. To make the student industry ready in terms of his/her ability to communicate effectively
2. To enhance the ability of written communication by giving a primer on English
3. To provide hands-on experience through case studies, mini-projects, group and individual presentations.
4. To effectively integrate English language learning with employability skills and training.
5. To augment the ability of the student to create, compose, render presentations with or without the help of media instructions and materials.

Course Outcomes:

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

1. Express their ideas in society and the workplace with proper words.
2. Analyze and synthesize research articles and technical reports with different critical perspectives.
3. Demonstrate proficiency in interpersonal communication, small group interactions and public speaking, comprehension, writing and speaking skills.
4. Perform as an accomplished professional communicator.
5. Plan and prepare effective presentations present and deliver speeches in public.

COURSE CONTENT

English		**Semester:**	**I or II**
Teaching Scheme:		**Examination scheme**	
Lectures:	**01 hour/week**	**End semester exam (ESE):**	--
		Duration of ESE:	--
		Internal Sessional Exams (ISE):	--

Unit–I:	**No. of Lectures: 03 Hours**	

Vocabulary Building

1.1 The concept of Word Formation
1.2 Acquaintance with prefixes and suffixes in word formation.
1.3 Synonyms and antonyms.

Unit–II:	**No. of Lectures: 03 Hours**	

2. Basic Writing Skills

2.1 Job Application
2.2 Preparing CV/Résumé
2.3 Business correspondence: Layout of Business letter, (complaint & adjustment, Invitation, order, inquiry, reply letters)
2.4 Academic writing: Research article
2.5 Report writing

2.6 Book/Film reviews

UNIT-III:	No. of Lectures: 03 Hours	

3. Oral Communication
3.1 Introducing oneself
3.2 Asking questions and giving polite replies
3.3 Complaining and apologizing
3.4 Persuading people to do something
3.5 Seeking permission
3.6 Inviting friends and colleagues
3.7 Praising and complimenting people
3.8 Expressing sympathy
3.9 Using the telephone

Unit–IV:	No. of Lectures: 03 Hours	

4. Professional Communication
4.1 Interview Skills (campus recruitment): Interview Questions
4.2 Types of Interviews, how to Answer the Questions, Reasons for selecting & rejecting a candidate.
4.3 How to present well in the Interview?
4.4 Group Discussion
4.5 Difference between Group Discussion & Debate

Unit–V:	No. of Lectures: 02 Hours	

5. Public Speaking and Presentation Skills
5.1 Effective Presentation Strategies
5.2 Preparation, structuring the Presentation, Visual Aids, Positive and Negative traits
5.3 Public speaking

Text Book		

1. Raymond Murphy, Essential English Grammar, Cambridge University Press, 2nd edition
2. Rajinder Pal & Prem Lata, English Grammar &Composition, Sultan Chand Publication

Reference Books:

1. Michael Swan, Practical English Usage. Oxford University Press. 1995.
2. English Vocabulary in Use- McCarthy, Michael., Cambridge University Press.
3. An introduction to Professional English and Soft Skills by B. K. Das et al., Cambridge University Press (Facilitated by BPUT)
4. Business Correspondence and Report Writing- 5th Ed., R C Sharma Krishna Mohan, McGraw Hill Education private Limited, New Delhi- 2017.
5. Sanjay Kumar and Pushp Lata, Communication Skills, Oxford University Press. 2011.
6. The Functional Aspects of Communication Skills- Prasad, P. S.K. Kataria & Sons Publication, Delhi.

NPTEL Links:

1. Business English Communication by Prof. Aysha Iqbal, IIT MADRAS, https://nptel.ac.in/courses/109106129
2. Communication Skills by Prof. Dr. T. Ravichandran, IIT KANPUR, https://nptel.ac.in/courses/109104031

ENGLISH LAB					
LAB COURSE OUTLINE					
Course Title:	**English Lab**	**Short Title:**	**ENG** (Lab)	**Course Code:**	
Prerequisite course(s):					

11th & 12th English			
LAB COURSE CONTENT			
English Lab		**Semester:**	**I or II**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**--**
		Internal Continuous Assessment(ICA):	**25 marks**

Concerned faculty member should suitably frame SIX laboratory assignments in the form of interactive Practice Sessions in Language Lab from the following list. Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds and to be able to mark stress, and recognize and use the right intonation in sentences.

1. **Listening Comprehension:**
   - **Activity 1**: Listening to words and sentences with different accents
   - **Practice 1**: Articulate the words and sentences
   - **Practice 2**: Reconstruct the sentences with simple questions and answers.
2. **Pronunciation, Intonation, Stress and Rhythm:**
   - **Activity 2**: Ask the students to read any classics loudly with special emphasis on stress and rhythm.
   - **Practice 1**: Synthesize the read piece and narrate the story.
   - **Practice 2:** Perform any classic plays with special emphasis on dialogue delivery.
3. **Common Everyday Situations: Conversations and Dialogues:**
   - Activity 3: Compose Verbal – Non-verbal Communication scripts.
   - Practice 1: Dramatize Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions
4. **Introducing oneself and Introducing others:**
   - Activity 4: Understand the Different styles of self-introduction
   - Practice: Introducing oneself and Introducing others
5. **Communication at Workplace:**
   - Activity 5: Understand the Workplace communication
   - Practice: Communication at the Workplace
6. **Interviews:**
   - Activity 6: Understand the Interview Skills and Etiquette.
   - Practice: Mock Interviews, Group Discussion

Text Books:

1. Raymond Murphy, Essential English Grammar, Cambridge University Press, 2nd edition
2. Rajinder Pal & Prem Lata, English Grammar &Composition, Sultan Chand Publication

Reference Books:

1. Michael Swan, Practical English Usage. Oxford University Press, 1995.
2. F.T. Wood. Remedial English Grammar. MacMillan Publication, 2007
3. Hamp-Lyons and Ben Heasly, Study Writing. Liz Cambridge University Press. 2006.
4. Sanjay Kumar and Pushp Lata, Communication Skills, Oxford University Press. 2011.
5. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

NPTEL Links:

1. Business English Communication by Prof. Aysha Iqbal, IIT MADRAS, https://nptel.ac.in/courses/109106129 2. Technical English for Engineers, by Prof. Aysha Iqbal, IIT MADRAS, https://nptel.ac.in/courses/109106094
Guide lines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on the completion date declared for each assignment.

INDIAN KNOWLEDGE SYSTEM					
COURSE OUTLINE					
Course Title:	**Indian Knowledge System**	**Short Title:**	**IKS**	**Course Code:**	

Course description:

India is a nation with a long civilizational history. It has discovered enormous knowledge cutting across various dimensions of human life and existence. Today, though India is known for its achievement in Yoga and other spiritual studies, it has made enormous progress in the material life as well. From metallurgy to civil engineering, pre-modern Indians can boast of tremendous achievements. The fact that many of their engineering marvels have survived the test of time is a testament to their knowledge and skill. Such achievements also assume significant advances in certain basic sciences like Mathematics.
A technical student must have an introductory background of this knowledge.

	Hours/week	**No. of weeks**	**Total hours**	**Semester credits**
Theory	**1**	**14**	**14**	**2**
Practical	**2**	**14**	**28**	

Prerequisite course(s):

Course objectives:

1. A student of engineering must be aware of the knowledge system prevailed in ancient time to develop a self – pride.
2. The students should know the relevance of traditional knowledge in modern times.
3. Students studying IKS can develop analytical skills and learn to approach problems from diverse perspectives, fostering creativity and scholarly agility.
4. Studying IKS as part of modern education can foster interdisciplinary research resulting in a harmonious blend of various knowledge systems
5. The main objective of drawing from our past and integrating the Indian Knowledge Systems is to ensure that our ancient systems of knowledge represented by unbroken tradition of knowledge transmission and providing a unique perspective (Bhāratiya Drishti) is used to solve the current and emerging challenges of India and world.

Course outcomes:

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

1. To be able to appraise the basic idea about IKS and ancient scripture,
2. To demonstrate an ability in ancient mathematical approaches and astronomy.
3. To be able to recognize and describe the ancient Indian industrial engineering.
4. To have an ability to experiment with ancient Indian architecture and its relevance today.
5. To be able to relate the evolution and development of languages in India in today's context.

COURSE CONTENT

Indian Knowledge System		**Semester:**	**I or II**
Teaching Scheme:		**Examination scheme**	
Lectures:	**1 hours /week**	**End semester exam (ESE):**	**----**
Practical:	**2 hours / week**	**Duration of ESE:**	**----**
		Internal Sessional Exams (ISE) CA:	**25 Marks**

Unit–I:	No. of Lectures: 02 Hours	

Indian Knowledge System – An Introduction:
Concept of IKS, Need of IKS, Organization of IKS, Historicity of IKS, some Salient Aspects of IKS.

The Vedic Corpus:
Introduction to Vedas, A synopsis of the four Vedas, Sub-classification of Vedas, Messages in Vedas, Vedic Life: A Distinctive Features, its modern-day relevance.

Reference:
Indian Knowledge System (IKS): Concepts and Applications in Science by Prof. B. Mahadevan, Dr. Vinayak Rajat Bhat, Dr. R Venkata Raghavan, https://onlinecourses.swayam2.ac.in/imb23_mg54/preview

Unit – II:	No. of Lectures: 03 Hours	

Number Systems and Units of Measurement:
Number systems in India - Historical evidence, Salient aspects of Indian Mathematics, Bhūta-Saṃkhyā system, Kaṭapayādi system, Measurements for time, distance, and weight, Piṅgala and the Binary system

Mathematics:
Introduction to Indian Mathematics, Unique aspects of Indian Mathematics, Indian Mathematicians and their Contributions, Algebra, Geometry, Trigonometry, problems in Chandaḥ Śāstra.

Reference:
Indian Knowledge System (IKS): Concepts and Applications in Science by Prof. B. Mahadevan, Dr. Vinayak Rajat Bhat, Dr. R Venkata Raghavan, https://onlinecourses.swayam2.ac.in/imb23_mg54/preview

Unit – III:	No. of Lectures: 03 Hours	

Astronomy:
Introduction to Indian astronomy, Indian contributions in astronomy, The celestial coordinate system, Elements of the Indian calendar, Notion of years and months, Pañcāṅga – The Indian calendar system, Jantar Mantar of Rājā Jai Singh Sawai.

Engineering and Technology: Metals and Metal working:
The rise and fall of a great Indian technology, Mining and ore extraction, Metals and metalworking technology, Iron and steel in India, Lost wax casting of idols and artifacts,

Reference:
Indian Knowledge System (IKS): Concepts and Applications in Science by Prof. B. Mahadevan, Dr. Vinayak Rajat Bhat, Dr. R Venkata Raghavan, https://onlinecourses.swayam2.ac.in/imb23_mg54/preview

Unit – IV:	No. of Lectures: 03 Hours	

Engineering, Technology and Other applications:
Irrigation systems and practices in India, Literary sources for science and technology, Physical structures in India, water management, Dyes and painting technology, The art of making perfumes, Surgical techniques, Shipbuilding, Sixty-four art forms (64 Kalās),

Town Planning and Architecture:
Perspective of Arthaśāstra on town planning, Vāstu-śāstra – The science of architecture, Eight limbs of Vāstu, Town planning, Marvelous Temple architecture in India.

References:

1. Indian Knowledge System (IKS): Concepts and Applications in Science by Prof. B. Mahadevan, Dr. Vinayak Rajat Bhat, Dr. R Venkata Raghavan, https://onlinecourses.swayam2.ac.in/imb23_mg54/preview
2. Introduction to urban planning by Prof. Harshit Sosan Lakra, https://archive.nptel.ac.in/courses/124/107/124107158/

Unit –V:	**No. of Lectures: 03 Hours**	

Knowledge Framework and classifications:

Indian scheme of knowledge, The knowledge triangle, Prameya – A vaiśeṣikan approach to physical reality, Dravyas – the constituents of the physical reality, Attributes – the properties of substances and Action – the driver of conjunction and disjunction, Saṃśaya – ambiguities in existing knowledge, Framework for establishing valid knowledge.

Reference:

Introduction to knowledge management by Prof Kailas B L Shrivastava, https://archive.nptel.ac.in/courses/110/105/110105076/

Linguistics

Introduction to Linguistics, Aṣṭādhyāyī, Phonetics, Word generation, Computational aspects, Sentence formation, Verbs and prefixes
Role of Sanskrit in natural language processing

Reference:

Introduction To Language and Linguistics by Prof. Dripta Piplai (Mondal), Prof. Bornini Lahiri, https://onlinecourses.nptel.ac.in/noc23_hs87/preview

Text Books:

1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavana R.N. (2022), "Introduction to Indian Knowledge System: Concepts and Applications", PHI Learning Private Ltd. Delhi.

Additional reading:

1. Pride of India: A Glimpse into India's Scientific Heritage, Samskrita Bharati, New Delhi.
2. Sampad and Vijay (2011). "The Wonder that is Sanskrit", Sri Aurobindo Society, Puducherry.
3. Bag, A.K. (1979). Mathematics in Ancient and Medieval India, Chaukhamba Orientalia, New Delhi.
4. Datta, B. and Singh, A.N. (1962). History of Hindu Mathematics: Parts I and II, Asia Publishing House, Mumbai.
5. Kak, S.C. (1987). "On Astronomy in Ancient India", Indian Journal of History of Science, 22(3), pp. 205–221.
6. Subbarayappa, B.V. and Sarma, K.V. (1985). Indian Astronomy: A Source Book, Nehru Centre, Mumbai.
7. Bag, A.K. (1997). History of Technology in India, Vol. I, Indian National Science Academy, New Delhi.
8. Acarya, P.K. (1996). Indian Architecture, Munshiram Manoharlal Publishers, New Delhi.
9. Banerjea, P. (1916). Public Administration in Ancient India, Macmillan, London.

10. Kapoor Kapil, Singh Avadhesh (2021). “Indian Knowledge Systems Vol – I & II”, Indian Institute of Advanced Study, Shimla, H.P.

Guide lines for ICA:

Concerned faculty member should suitably frame SIX assignments based on the above syllabus. Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignment.

CO-CURRICULAR COURSE					
COURSE OUTLINE					
Course Title:	**Co-Curricular Course**	**Short Title:**	**CC**	**Course Code:**	

Course description:

The course aims at study, activity or program that takes place outside of the traditional classroom but in some manner complements academic learning from classroom curriculum.

	Hours/week	No. of weeks	Total hours	Semester credits
Theory	**1**	**14**	**14**	**2**
Practical	**2**	**14**	**28**	

Prerequisite course(s):

Course objectives:

The objectives of the course are to:

1. Develop competencies so as to provide sense of identity.
2. Develop an optimal state of physical, emotional, intellectual, social, spiritual and environmental wellbeing.

Course outcomes:

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

1. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
2. Communicate effectively on activities with the community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
3. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

COURSE CONTENT

Co-Curricular Course		**Semester:**	**I**
Teaching Scheme:		**Examination scheme**	
Lectures:	**1 hours /week**	**End semester exam (ESE):**	**----**
Practical:	**2 hours / week**	**Duration of ESE:**	**----**
		Internal Sessional Exams (ISE) CA:	**50 Marks**

Students should choose any TWO modules from the following and should be clustered based on chosen module. Institute should provide faculty mentor for every cluster to facilitate students to learn / upskill / sharpen / practice on chosen module. Students may also take help of experts, faculty members and others to enhance their skills. Faculty mentors should conduct weekly meeting of their students to monitor their progress.

Module – 1: Yoga and Positive Psychology for Managing Career and Life (10 hrs.)

Yoga is known to enhance flexibility, strength and coordination. Apart from enhancing muscle flexibility and strength, yoga can also help with weight loss and improve body posture. Regular Yoga practice has also been associated with optimizing body functions like respiration, heart rate, lowering of blood pressure, keeping cardiovascular health problems at bay and more.

Today obesity has become a potent problem on account of the increase in consumption of junk food and a sedentary lifestyle. Yoga helps student counter these adverse effects and lead a healthy and energetic. The need and importance of yoga in education also follows from the fact that it helps in improving concentration and attention span. With yoga helping to improve memory function, its direct impact can also be seen in the student's academic performance.

Topics:
Importance of yoga, yogic perspective of Health and Wellbeing, Diseases in yogic perspective, Managing mind, self-realization – the ultimate joy, How yoga helps in equanimity of mind, seven stages of wisdom, yoga for balancing Emotions and cognitions, Pranayama, What is our real nature, How mind works, Journey of positive psychology, Difference in good life and life satisfaction, Why yoga with positive psychology, Fundamental questions in positive psychology, What positive psychology is not, positive negative dialects of well-being, obstacles in wellbeing, positive psychology: second wave, Present context of professional work, Link between self-management and career management.

Reference: Yoga & Positive Psychology for Managing Career and Life by IIT Bombay, https://archive.nptel.ac.in/courses/110/101/110101165/

Module – 2: Food, Nutrition and Hygiene (10 hrs.)

Food and Nutrition deals with the processing and preservation food as well as consumption of balanced diet by individual. Nutritional Science has its roots in life sciences; it encompasses both biological and social sciences. Nutrition plays a major role in enhancing the quality of life through improved physical growth, immune-competence and enhancing productivity with improved health. Social, economic and cultural factors influence food consumption pattern and thus nutrition status of the individual. Further, Changes in nutrient composition during food processing and storage also needed to be studied.

Topics:
Introduction to nutrition and health, Relation between food, nutrition and health, Digestion and absorption of nutrients, recommended diet, carbohydrate Nutrients and their role, Fiber, Protein, fat and fat soluble vitamins, Water soluble vitamins, Meal planning, Nutritional Disorder, balance diet and food groups, Practical aspects of food selection, Sanitization and therapeutic nutrition, Food sanitation and hygiene, Water purification, Principles of therapeutic diet, Diet during fever, Diet during various diseases.

Reference:
Nutrition, Therapeutics and Health (NM) by IIT Kanpur, https://nptel.ac.in/courses/126104004

Module – 3: Stress Management (10 hrs.)

The goal of stress management is to control an individual's level of stress, particularly chronic stress, usually with the intention of enhancing daily functioning. It encompasses a broad range of approaches and psychotherapies. Many mental and physical signs of stress arise, and they differ depending on the circumstances surrounding each person. A deterioration in physical health, such as depression and headaches, chest pain, exhaustion, and sleep issues, can be among them. One of the secrets to a successful and happy existence in contemporary culture is stress management. Stress management offers several strategies to control anxiety and preserve

general wellbeing, yet life frequently presents a plethora of expectations that can be challenging to meet.

Topics:
What is stress, Sources of stress, Types of stress, Personality factors and stress, Stress and college students, Stress and nervous system, Hypothalamic Pituitary Adrenal (HPA) Axis, Effect of stress on immune system, Health risks associated with chronic stress, Stress and major Psychiatric disorder, Understanding your stress level, Role of personality pattern, Self-esteem, Locus of control, Role of thought beliefs and emotions, Situation Intrapersonal, Developing Cognitive copying skill, Autogenic training, Imaginary and progressive relaxation, Other relaxation techniques, Exercise and health

Reference:
Stress Management by Prof. Rajlakshmi Guha,
https://archive.nptel.ac.in/courses/121/105/121105009/

Module – 4: Group Dynamics (10 hr)
Groups are important for organizational life. Managers spend substantial time in managing groups and teams so that groups contribute to organizational and group goals. How effectively a manager plans, organizes, staffs, leads and controls depends upon how effectively he manages the groups. Group dynamics studies the nature, formation and reasons for forming the groups. It studies how groups affect the behavior and attitude of members and the organization. It is a process by which people interact with each other. If groups are effectively managed, they contribute a lot to organizational goals.

Topics:
Introduction of groups, Groups Dynamics: Definition, Meaning, Concept and Importance of Group Dynamics Group processes, Interpersonal attraction and Cohesion in Group Dynamics, Social relationship, Group Communication, Role of Communication in Group Dynamics, Interactive behaviour, Group leadership, Organizational justice, ethics and corporate social responsibility.

Reference:
Group Dynamics by Prof. Pooja Garg, https://archive.nptel.ac.in/courses/109/107/109107199/

Module – 5: Body Language and Behavior (10 hr)
Body language is the use of physical behavior, expressions, and mannerisms to communicate nonverbally, often done instinctively rather than consciously. When we interact with others, we are continuously giving and receiving wordless signals. Micro expressions (brief displays of emotion on the face), hand gestures, posture, smile, hand movement, finger movement, and movement of feet and legs all register in the human brain almost immediately, even when a person is not consciously aware they have perceived anything.

Topics:
Defining Body language, Scope and relevance, Defining proxemics, Four Zones, Behavioural connotations, Oculesics: Use of eye communication, Haptic: Language of touch, Kinesics: Body

Motion and Gesture, Facial expression, Macro and Micro Facial Expressions, Mouth and smiles, Cultural differences in smile, hand and feet movement, finger movement, Paralanguage, Chromatics, Digital Body language, Gustorics and silence.

Reference:
Body Language: A Key to Professional Success by Prof. Rashmi Gaur,
https://archive.nptel.ac.in/courses/109/107/109107154/

Module – 6: Sports and Fitness
Any out door or indoor sports, rules pertaining to the sport, fitness and exercises pertaining to the sport, psychological factors pertaining to the sport, injury management pertaining to the sport. Focus on improvement of various components of physique and skills related to fitness like strength, speed, coordination, endurance and flexibility; acquisition of sports skills, basic movement skills relevant to the sport; improvement of tactical ability; and improvement of mental abilities.

Module – 7: Cultural Activities
Practicing and participating any music, art, handicraft and cultural activities

Module – 8: Hobby Skilling
Building and upskilling any Social Hobbies, Physical & Health Hobbies, Creating & Creative hobbies etc.

Module – 9: NSS/NCC
Enrolling and Participating in NSS / NCC activities

Module – 10: Publication and Presentation
Publication of articles in newspapers, magazines etc. OR Submission / Publication of innovation ideas in conferences / workshops / journals / recognized forum etc.

Module 11: Environmental Sustainability
Environmental issues are one of the primary causes of disease, health issues and long-term livelihood impact. Major environmental issues that India and this region face today are Air pollution, poor management of waste, growing water scarcity, falling groundwater tables, water pollution, preservation and quality of forests, biodiversity loss, and land/soil, environmental degradation, public health, loss of resilience in ecosystems, livelihood security etc. The major sources of pollution that mandates action plan for Air Quality Management Waste Management and Water Quality Management**.**
More precisely plastic waste has been a major concern. The plastic waste is responsible for greenhouse gas emissions, end up in water bodies and make up debris in sea and river, species have been impacted by plastic debris, soil contamination and leaching of toxic chemicals into the ground, causing air pollution, and ultimately into food chain and public health.
Any participation / activity towards Environmental Sustainability as an individual or team with or without support of any agencies / NGOs / voluntary bodies may be carried out. The activities include survey and analysis, management and action plan, methodology and technical solution, standard operating procedure, detailed project report (DPR), public awareness campaign, sampling and segregation, collection and disposal etc.

Guide lines for ICA:

Students must submit ICA in the form of journal. Each should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each on completion date declared for each.

The assessment for the same should be based on the following.

1. Pre and Post assessment for each module to judge the level of understanding / improvement. (55%)
2. Contribution as an individual, or as a member or leader in diverse teams. (15%)
3. Communication skill through presentation / report / publications etc. (15%)
4. Participation in events / activities / awareness program or development of model / poster / video / e-content / blog etc. (15%)

A three-member panel of faculty members including faculty mentor will assess and grade or mark at mid of semester and end of semester.

ENGINEERING MATHEMATICS-II					
COURSE OUTLINE					
Course Title:	**Engineering Mathematics -II**	**Short Title:**	**M-II**	**Course Code:**	

Course description: This course is aimed at introducing the fundamentals of basic Mathematics to undergraduate students. The background expected includes a prior knowledge of Mathematics from 12th science and familiarity with various laws, principles and theories. The goals of the course are to understand the basic principle of Mathematics and its application in different area.

	Hours/week	**No. of weeks**	**Total hours**	**Semester credits**
Theory	03	14	42	4
Tutorial	01	14	14	

Prerequisite course(s): 11th & 12th mathematics

Course objectives:

The objective of this course is to familiarize the prospective engineers with techniques in numerical methods, sampling, ordinary differential equation and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines

Course outcomes:

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

1. Apply effective mathematical tools for the solutions of differential equations that model physical processes.
2. Introduce the solution methodologies for Laplace transform with applications in engineering.
3. Understand basic concept of test of significance and apply it to find solutions in engineering field.
4. Find numerical values of differentiations and integrations using various numerical methods.
5. Understand concept of Complex number and apply it to find solutions in engineering field.

COURSE CONTENT

Engineering Mathematics -II		**Semester:**	**II**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
Tutorial	**1 hour/week**	**Duration of ESE:**	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**

First Order Ordinary Differential equations: Exact Differential equations, Integrating Factor, Equations reducible to exact, Linear Differential equations, Application related to Electrical Circuits

Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**

Laplace Transform: Properties of Laplace Transform, Laplace transform of standard functions, Inverse Laplace transform, Convolution theorem, Ordinary differential equations by Laplace transform

Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**

Test of Significance: Testing of Hypothesis, Null Hypothesis and Alternative Hypothesis, Level of Significance, Test of Significance of large sample, Testing for difference between means and proportion of samples.

Unit–IV:	No. of Lectures: 08 Hours	Marks: 12
Numerical Methods: Solution of Ordinary differential equations: by Taylor's series and Picard's Method. Runge-Kutta method of fourth order for solving first order differential equations. Curve Fitting: Method of least square, fitting of straight lines, second degree parabola.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Complex Number: Circular functions, Hyperbolic and Inverse Hyperbolic functions, Logarithms of complex number, Resolving real and imaginary parts of a complex number.		

Text Books:

1. H. K. DASS "Advance Engineering Mathematics", S. Chand publications.

Reference Books:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ravish R. Singh, Mukul Bhatt "Engineering Mathematics A Tutorial Approach. Tata Mc GrawHill Education Private Limited. New Delhi
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010

NPTEL Links:

1. 'Laplace Transform and its Existence' - Mathematics (IIT Kharagpur) Video Lectures by Dr. P. Panigrahi, Prof. J. Kumar, Prof. P.D. Srivastava, Prof. Somesh Kumar (nptelvideos.com)
2. Mathematical Methods and Its Applications by Prof. P. N. Agarwal, Prof. S. K. Gupta, https://onlinecourses.nptel.ac.in/noc23_ma89/preview
3. Differential Equations by Mr. Mohamed Nishad Maniparamabth, https://onlinecourses.swayam2.ac.in/cec24_ma09/preview
4. Descriptive Statistics by Dr Vidya Raju, https://onlinecourses.swayam2.ac.in/cec24_ma03/preview
5. 'Advanced Engineering Mathematics' Video Lectures from IIT Kharagpur by Dr. P. Panigrahi, Prof. J. Kumar, Prof. P.D. Srivastava, Prof. Somesh Kumar - Mathematics NPTEL Video Lectures (nptelvideos.com)
6. 'Complex Analysis' Video Lectures from IIT Guwahati by Prof. P. A. S. Sree Krishna - Mathematics NPTEL Video Lectures (nptelvideos.com)
7. 'Ordinary Differential Equations and Applications' Video Lectures from IISc Bangalore by A. K. Nandakumaran Raju, K. George, P. S. Datti - Mathematics NPTEL Video Lectures (nptelvideos.com)

INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING					
COURSE OUTLINE					
Course Title:	**Introduction to Artificial Intelligence and Machine Learning**	**Short Title:**	AIML	**Course Code:**	

Course description:

This course provides students with a fundamental and comprehensive study of artificial intelligence and machine learning using Python programming language. This course focuses on introduction to program design and AI problem solving using the Python programming language. Programming topics include importing and using various libraries in Python for AI and ML.

	Hours/week	**No. of weeks**	**Total hours**	**Semester credits**
Theory	03	14	42	04
Practical	02	14	28	

Prerequisite course(s):

Basic Mathematical Concepts, Fundamental Logical Thinking, Programming for Problem Solving, Basic Quantitative and Logical Reasoning

Course objectives:

The objective of this course is to impart knowledge so that the student will:

1. Recognize fundamental uses of AI and ML
2. Design an application for solving basic AI and ML problems
3. Apply the basics and features of Python programming
4. Analyze various libraries in Python
5. Analyze various modules in Python

Course outcomes:

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

1. Determine societal issues where AI may help solve.
2. Use and apply various ML approaches in solving the basic problems
3. Use and apply various deep learning approaches in solving the basic problems
4. Apply an appropriate programming feature to solve basic problems
5. Demonstrate significant skills with the Python libraries and modules

COURSE CONTENT

Introduction to Artificial Intelligence and Machine Learning		**Semester:**	**II**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE) UA:**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE) CA:	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**

Introduction to Artificial Intelligence (AI)

Introduction to AI, Alan Turing and the Turing Test, Forms of AI: Strong AI and Weak AI, Golden Age of AI, AI Winter, The Rise and Fall of Expert System, Neural Network and Deep Learning, Technological Drivers of Modern AI, Structure of AI, Data the Fuel for AI: Types of Data, Big Data, Characteristics of Big Data, Database, Data Process.

Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**

Introduction to Machine Learning (ML)

What is Machine Learning? What Can You Do with Machine Learning? The Machine Learning Process, Types of Machine Learning: Supervised Learning, Unsupervised Learning,

Reinforcement Learning, Semi-supervised Learning, Introduction to Common Types of Machine Learning Algorithms: Naïve Bayes Classifier, K-Nearest Neighbor, Linear Regression, Decision Tree, Ensemble Modeling and K-Means Clustering.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Introduction to Deep Learning (DL)		
What is Deep Learning? Difference Between Deep Learning and Machine Learning, The Brain and Deep Learning, Artificial Neural Networks: Backpropagation, Recurrent Neural Network, Convolutional Neural Network, Generative Adversarial Networks, Deep Learning Applications, Deep Learning Hardware, When to Use Deep Learning? Drawbacks with Deep Learning.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Basics of Python Programming		
Features of Python, History and Future of Python, Writing and Executing Python Program, Literal Constants, Variables and Identifiers, Data Types, Input Operation, Comments, Reserved Words, Indentation, Operators and Expressions, Expressions in Python, Operations on Strings in Python and Type Conversion in Python.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Functions and Modules in Python		
Need for Functions and Modules: Definition, Call, Variable Scope and Lifetime, The Return Statement in Python, Defining and using Functions, Introduction to Modules in Python, Introduction to Packages in Python, Introduction to Standard Library Modules, Import Statement and Packages in Python, Built-in String Methods in Python, Standard Library Modules in Python.		
Text Books:		
1. Tom Taulli, Artificial Intelligence Basics: A Non-Technical Introduction, Apress, 2019 2. Reema Thareja, Python Programming Using Problem Solving Approach, Oxford University Press, ISBN 13: 978-0-19-948017-6		
Reference Books:		
1. Andeas C. Muller and Sarah Guido, Introduction to Machine Learning with Python: A Guide for Data Scientist, O'REILLY 2. John H.Guttag, Introduction to Computation and Programming using Python with Application to Computational Modeling and Understanding Data, 3rd Edition, MIT Press, 2021 3. Mark Lutz, Programming Python, O'REILLY, 4th Edition 4. David Amos, Dan Bader, Joanna Jablonski, Fletcher Heisler, Python Basics: A Practical Introduction to Python 3, 4th Edition		
NPTEL Links:		
1. Fundamentals of Artificial Intelligence by Prof. Shyamanta M Hazarika: https://onlinecourses.nptel.ac.in/noc19_me71/preview 2. Introduction to Machine Learning by Prof. Sudeshna Sarkar: https://onlinecourses.nptel.ac.in/noc21_cs85/preview		

INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LAB			
LAB COURSE CONTENT			
Introduction to Artificial Intelligence and Machine Learning Lab		**Semester:**	**II**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE) UA: PR**	**25 marks**

	Internal Continuous Assessment (ICA) CA:	**25 marks**
End Semester Exam (ESE) Pattern:	**Practical (PR)**	

Concerned faculty member should suitably frame FIVE laboratory assignments from the following list:

1. Create a python program, which receives full date and display the calendar of the current, previous and next year
2. Create a python program to find L.C.M. (least common multiple) of two numbers
3. Create a python program to reverse words in a given string
4. Create a python program for finding yesterday's, today's and tomorrow's date
5. Apply python libraries and demonstrate various matrix operations
6. Apply python libraries and demonstrate various math's operations
7. Apply python libraries and demonstrate various string operations

Text Books:

1. Anand Chitipothu, Python Practice Book, 2017
2. Brian Heinold, A Practical Introduction to Python Programming, 2012
3. David Amos, Dan Bader, Joanna Jablonski, Fletcher Heisler, Python Basics: A Practical Introduction to Python 3, 4th Edition

Reference Books:

1. Andeas C. Muller and Sarah Guido, Introduction to Machine Learning with Python: A Guide for Data Scientist, O'REILLY
2. John H.Guttag, Introduction to Computation and Programming using Python with Application to Computational Modeling and Understanding Data, 3rd Edition, MIT Press, 2021
3. Mark Lutz, Programming Python, O'REILLY, 4th Edition

NPTEL Links:

The Joy of Computing using Python Prof. Sudarshan Iyengar,
https://nptel.ac.in/courses/106106182

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignment.

Guidelines for ESE:

ESE will be based on the laboratory assignments submitted by the students in the form of journal. In ESE the student may be asked to perform any one practical. Evaluation will be based on paper work and performance in the practical.

LIBERAL LEARNING COURSE

COURSE OUTLINE

Course Title:	**Liberal Learning Course**	**Short Title:**	**LLC**	**Course Code:**	

Course description:

Liberal learning is "self-learning in self-chosen liberal areas with self-defined scope". The Liberal learning provides the higher levels of learning, as per learning pyramid, similar to learning through teaching others. Liberal learning broadens students' perspectives and helps them develop as individuals and members of an inclusive society in which their technical skills and services are used. This course mainly helps students on building diverse knowledge base and scaling new real life professional challenges. The course includes activities that enable students think independently and develop broad academic and intellectual abilities.

	Hours/week	**No. of weeks**	**Total hours**	**Semester credits**
Theory	**1**	**14**	**14**	**2**
Practical	**2**	**14**	**28**	

Prerequisite course(s):

Course objectives:

The primary objective of the course is to inculcate a lifelong learning process that allows students to extend their knowledge horizons beyond engineering and make them better learners. The course objectives also include functioning in multidisciplinary teams, understanding the impact of engineering solutions in global and societal contexts.

Course outcomes:

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

1. Create opportunities to experiment different learning styles and bring in the required balance.
2. Explore insights from many different perspectives of professional challenges.

COURSE CONTENT

Liberal Learning Course		**Semester:**	**II**
Teaching Scheme:		**Examination scheme**	
Lectures:	**1 hours /week**	**End semester exam (ESE):**	**----**
Practical:	**2 hours / week**	**Duration of ESE:**	**----**
		Internal Sessional Exams (ISE) CA:	**50 Marks**

Unlike a standard course, this course does not have a defined syllabus, identified text or reference books, classroom lectures, and standard examinations. Students define their own syllabus, search for learning resources, study them to develop their own viewpoints and find appropriate ways to share learning with peers.

Students should identify a self-chosen area / sub-area in engineering, non-engineering or societal issues and should be clustered based on chosen area / sub-area. Institute should provide faculty mentor for every cluster to facilitate students to outline their title of study, purpose of study and corresponding focus questions. Students may also take help of experts,

faculty members and others to enhance their focus questions. Students should carry out their study focusing on the questions and develop their own viewpoint. Faculty mentors should conduct weekly meeting of their students to monitor their progress.
Preferably, the outcome of the study should be in the form of prototype, model, poster, project or Do It Yourself (DIY) promoting ideation and innovation in the chosen area / sub-area.
Students may also join week end Internship outside the campus to study and develop their viewpoints on the focused questions.

Guide lines for ICA:

Students must submit ICA in the form of report. The report format may be according to the chosen area / sub-area.

The assessment for the same should be based on the following.

a) Novelty, Relevance, Reasoning, Process of choice of topic: 5%
b) Comprehensiveness and diversity of the gathered information for the study: 25%
c) Originality of the viewpoints, Value of the viewpoints: 30%
d) Methods of sharing, effectiveness of the sharing through presentation or any other mode: 30%
e) Development plan and result of the plan as a learner: 10%

A three-member panel of faculty members including faculty mentor will assess and grade or mark at mid of semester and end of semester.

EXIT COURSE

Internship / Apprenticeship:

Internship / Apprenticeship / OJT shall be corresponding to the programme (Major) subject. Internship / Apprenticeship / OJT shall be monitored jointly by faculty and Industry / organization mentor.

The role of a Mentor, nominated by institute, shall be to provide professional/research guidance to the student during the internship. They shall also facilitate networking with other subject matter experts/professionals, which will enhance the internship experience and learning of the students.

Internship / Apprenticeship / OJT corresponding to the programme (Major) subject in Exit course with an external organization / entity is desirable. External organization may be industries, research institutions, University research centers or CSIR laboratories. Internship / Apprenticeship / OJT shall be preferably in offline mode, however online mode may also be permitted.

Preferably the Mini Project in Exit course shall be based on Internship / Apprenticeship / OJT.

Activities under Internship / Apprenticeship / OJT include Project work, Seminar, Industrial Training (excluding credits for Advanced Courses). This can be Industrial /

Govt. / NGO/MSME/ Rural Internship/ Innovation / Entrepreneurship / academic / industry research project.

After completion of Internship, students shall prepare a comprehensive report highlighting their learnings and takeaways during the internship period. The students are mandated to give a seminar based on the internship undertaken before an expert committee constituted by the concerned department and the assessment of internship shall be based on the following criteria:

1) Quality and effectiveness of presentation
2) Depth of knowledge and demonstrated skills
3) Variety and relevance of learning experience
4) Practical applications and relationships with concepts taught in the course
5) Internship Report
6) Attendance record, student diary (log), supervisor evaluation

Attendance record shall include daily attendance with IN and OUT time. It shall be signed by Industry supervisor.

Student Diary (log) shall include daily activities carried out by the student during Internship with Task assigned, Activities performed, key learnings etc. It shall be signed by Industry supervisor.

Supervisor evaluation form shall include the following with ratings in FIVE-point scale.

1) Behaviours
2) Performs in a dependable manner
3) Cooperates with co-workers and supervisors
4) Shows interest in work
5) Learns quickly
6) Shows initiative
7) Produces high quality work
8) Accepts responsibility
9) Accepts criticism
10) Demonstrates organizational skills
11) Uses technical knowledge and expertise
12) Shows good judgment
13) Demonstrates creativity/originality
14) Analyzes problems effectively
15) Is self-reliant
16) Communicates well
17) Writes effectively
18) Has a professional attitude
19) Gives a professional appearance
20) Is punctual
21) Uses time effectively

Supervisor evaluation form shall be signed by Industry supervisor.

Mini project:
The student shall carry out a Mini project based on the knowledge acquired during the degree course and/or Internship. The project may be either fully theoretical/practical or involving both theoretical and practical work to be assigned by the guide / mentor / department. The work may also be Study/Survey/Design or R&D work. The work may also be on specified task or project assigned to the students during Internship. The project may also be a sponsored project. The project shall be corresponding to the programme (Major) subject.

Upon completion of the Mini project, the student shall submit project report in the form of hard bound. Assessment for the Mini project shall also include presentation by the student. Assessment of Mini project shall be based on the following criteria:

1) Problem Identification / Project Objectives
2) Methodology / Design
3) Implementation
4) Results and Discussion
5) Conclusion
6) Report
7) Depth of Understanding
8) Presentation
9) Demonstration of the project

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