Curriculum for First Year B. Tech. Programme
Academic Year 2023-24

EDUCATION OF HUMAN POWER FOR TECHNOLOGICAL EXCELLENCE
उत्कृष्ट तंत्रज्ञानार्थम् जनशक्ती शिक्षणम्

Shri Guru Gobind Singhji Institute of Engineering and Technology
Vishnupuri, Nanded-431606
Maharashtra State, India
Government Aided Autonomous Institute

National Education Policy -2020

Implementation of the National Education Policy-2020 (NEP 2020) from AY 2023–24

As per the guidelines of the Government of Maharashtra, Higher and Technical Education Department, Government Resolution No.: NEP-2022/(67/23)/TE-2 dated July 4, 2023, in all Autonomous institutes and colleges, the National Education Policy 2020 will be implemented in the current academic year, i.e., 2023-2024. As per the GR directives, the institute NEP committee is formed, comprising all the Heads of departments, Dr. Amit V Nandedkar and the BoS chairman of first-year engineering. The institute NEP committee, under the chairpersonship of Dr. Y. V. Joshi, arranged the fruitful series of meetings. After thorough discussion, the committee proposed the first-year curriculum, which is going to implement from academic year 2023-24.

What is NEP-2020?

The NEP 2020 aims to provide a holistic and flexible learning experience to students. Multidisciplinary and a holistic education across the sciences, social sciences, arts, humanities, and sports for a multidisciplinary world in order to ensure the unity and integrity of all knowledge.

Credit Framework under Four-Years U.G. Engineering Programme with Multiple Entry and Multiple Exit options

The Four-year Bachelor's Multidisciplinary Engineering Degree Programme allows the students to experience the full range of holistic and multidisciplinary education in addition to a focus on the chosen major and minors as per their choices and the feasibility of exploring learning in different institutions. The minimum and maximum credit structure for different levels under the Four-year Bachelor's Multidisciplinary Engineering U. G. Programme with multiple entry and multiple exit options are as given below:

A. Credits offered per Semester will be a Minimum 20 and a Maximum 22. While minimum credits are mandatory as per National Credit Framework, the Universities and Autonomous Engineering Colleges can evolve the mechanism for providing Semester/ Level wise credit attainment flexibility within the broad framework.
B. With effect from Academic Year 2023-24, the first year of 4-Years Multidisciplinary Bachelor's Degree in Engg. / Tech. Program (B.E./ B.Tech. or Equivalent) will be introduced.

   The Four Year of Bachelor's Engg./ Tech. Degree (Level 6.0) with various options :

   Bachelor's Engg./ Tech. Degree in chosen Major Engg./ Tech. Discipline with Multidisciplinary Minor (160-176 credits),

OR

Bachelor's Engg./ Tech. Honours Degree in chosen Major Engg./ Tech. Discipline with Multidisciplinary Minor (180-194 credits)

OR

Bachelor's Engg./ Tech. Honours with Research Degree in chosen Major Engg./ Tech. Discipline with Multidisciplinary Minor (180-194 credits)

OR

Bachelor's Engg./ Tech. Degree in chosen Major Engg./ Tech. Discipline with Double Minor (Multidisciplinary and Specialization Minor, 180-194 credits)

Credit Framework

Levels	Qualification Title	Credit Requirements		Semester	Year
		Minimum	Maximum		
4.5	One Year UG Certificate in Engg. / Tech.	40	44	2	1
5.0	Two Years UG Diploma in Engg./ Tech.	80	88	4	2
5.5	Three Years Bachelor's Degree in Vocation (B. Voc.) or B.Sc. (Engg./ Tech.)	120	132	6	3
6.0	4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg. / Tech. with Multidisciplinary Minor.	160	176	8	4
6.0	4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg./ Tech. Honors and Multidisciplinary Minor	180	194	8	4
6.0	4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg./ Tech. Honors with Research and Multidisciplinary Minor	180	194	8	4
6.0	4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg./ Tech. Major Engg. Discipline with Double Minors (Multidisciplinary and Specialization Minors)	180	194	8	4

C. Under Bachelor's Engg./ Tech. Honours with Research Degree in chosen Major Engg./ Tech. Discipline with Multidisciplinary Minor (180-194 credits), the students will work on a research project or dissertation for 18 credits in the fourth year in the respective Major Engg./ Tech. Discipline. The decision regarding the distribution of 18 credits for Research Project in Semesters VII and VIII of the Fourth Year will be taken by Academic Authorities of University/ Autonomous Engineering Colleges. These 18 Credits will be over and above the minimum 160 – maximum 176 Credits prescribed for Four Year Multidisciplinary Bachelor's Degree in Engg./ Tech. Program.

D. The Bachelor's Engg./ Tech. Honours Degree in chosen Major Engg./ Tech. Discipline with Multidisciplinary Minor (180-194 credits) enables students to take up five-six additional courses in the same Engg./ Tech. discipline of 18 to 20 credits distributed over semesters III to VIII. The decision regarding the mechanism of distribution of these 18-20 credits over semesters III to VIII, which are over and above the minimum 160-maximum 176 Credits prescribed for Four Year Multidisciplinary Bachelor's Degree in Engg./ Tech., will be taken by Academic Authorities of University/ Autonomous Engineering Colleges.

E. 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. The decision regarding the mechanism of distribution of these 18-20 credits over semesters III to VIII, which are over and above the minimum 160-maximum - 176 Credits prescribed for Four Year Multidisciplinary Bachelor's Degree in Engg./ Tech., will be taken by Academic Authorities of University/ Autonomous Engineering Colleges.

Distribution of Credits across Four Years Engg./Tech. Degree Programmes:

In general, for the four years' bachelor's degree programme, the distribution of credits will be as follows:

(a) Major (Core) Subject comprising Mandatory and Elective Courses:
   i. Minimum 50% of total credits corresponding to Three/Four - year UG Degree-Mandatory Courses offered in all Four years;
   ii. Elective courses of Major will be offered in the third and/or final year.
   iii. Vocational Skill Courses, Internship/ Apprenticeship, Community Engagement Project (CEP)/ Field Projects (FP), Research Projects connected to Major

(b) Compulsory Multidisciplinary Minor Subject: 14 Credits
   i. The Minor subjects may be from the different disciplines of the Engineering faculty, or they can be from different faculty altogether.
   ii. The credits of compulsory Minor subjects shall be completed from the second year to the final year of UG Programme

(c) Generic/ Open Elective Courses (OE): 08 credits

i. It is to be offered in Second and/or Third year
ii. Faculty-wise baskets of OE shall be prepared by University/ Autonomous Engineering Colleges.
iii. OE is to be chosen compulsorily from faculty other than that of the Major Discipline.

(d) Vocational and Skill Enhancement Courses (VSEC): 08 credits

- Vocational Skill Courses (VSC): 04 credits, including Hands on Training corresponding to the Major and/or Minor Subject:
    i. To be offered in first three years;
    ii. Wherever applicable vocational courses will include skills based on advanced laboratory practical's of Major.
- Skill Enhancement Courses (SEC) : 04 credits
    i. To be offered in first three years;
    ii. To be selected from the basket of Skill Courses approved by University/ Autonomous Engineering Colleges

(e) Ability Enhancement Courses (AEC), Indian Knowledge System (IKS) and Value Education Courses (VEC): 10 Credits

- AEC: 04 credits
    i. To be offered in First and Second year
    ii. English: 02 Credits
    iii. Modern Indian Language: 02 credits
    iv. To be offered from the Basket approved by University / Autonomous College
- IKS: 02 Credits
    i. To be offered in First Year
    ii. Courses on IKS to be selected from the basket of IKS courses approved by University/ Autonomous Colleges or as per UGC Guidelines on IKS.
- VEC: 04 Credits
    i. To be offered in Second year
    ii. Value Education Courses (VEC) such as Understanding India, Environmental Science/Education, and Digital and Technological Solutions.

Illustrative Semester wise Credit distribution structure for Four Year UG Engineering Program – One Major, One Minor

Semester		I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course	BSC/ESC	06-08	08-10		--	--	--	--	--	14-18
Engineering Science Course		10-08	06-04		--	--	--	--	--	16-12
Programme Core Course (PCC)	Program Courses	--	02	08-10	08-10	10-12	08-10	04-06	04-06	44-56
Programme Elective Course (PEC)		--	--	--	--	04	08	02	06	20
Multidisciplinary Minor (MD M)	Multidisciplinary Courses		--	02	02	04	02	02	02	14
Open Elective (OE) Other than a particular program		--	--	04	02	02	--	--	--	08
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	02	02	--	02	--	02	--	--	08
Ability Enhancement Course (AEC -01, AEC -02)	Human Social Science and Management (HSSM)	02	--	--	02	--	--	--	--	04
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
Comm. Engg. Project (CEP)/Field Project (FP)		--	--	02	--	--	--	--	--	02
Project		--	--	--	--	--	--	--	04	04
Internship/ OJT		--	--	--	--	--	--	12	--	12
Co-curricular Courses (CC)	Liberal Learning Courses	02	02		--	--	--	--	--	04
Total Credits (Major)		**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**160-176**

Note: The Credit Distribution Table given above is illustrative only. The Universities/ Autonomous Colleges may suitably modify within the broader framework of credit distribution across seven verticals and as per the AICTE rules and regulation.

The UGC Regulations, 2021 permit up to 40% of the total courses being offered in a particular programme in a semester through the Online Learning Courses offered through the SWAYAM platform and/or other State Level Common Platforms which can be developed in due course with the participation of different Universities/ HTEIs.
Detailed information is given in the Government Resolution No.: NEP-2022/(67/23)/TE-2 dated July 4, 2023, Government of Maharashtra, Higher and Technical Education Department .

Multiple Exits: The following options are available for multiple exits in NEP-2020:.

Levels	Qualification Title	Additional Credit Requirements	Bridge Courses
4.5	One Year UG Certificate in Engg./Tech.	8	2-Months internship for 8-Credits **OR** Two skill based vocational courses of 8 credits (ITI Level)
5.0	Two Years UG Diploma in Engg/Tech	8	2-Months internship for 8-Credits **OR** Two skill based vocational courses of 8 credits (Diploma Level)
5.5	Three Years Bachelor's Degree in Vocation (B.Voc.) or B.Sc.(Engg/Tech)	8	2-Months internship for 8 Credits **OR** Two skill based vocational courses of 8 credits (Degree Level)

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GENERAL COURSE STRUCTURE & THEME

A. Definition of Credit

1 Hour Lecture (L) per week	1 Credit
1 Hour Tutorial (T) per week	1 Credit
1 Hour Practical (P) per week	0.5 Credit
2 Hours Practical (P) per week	1 Credit

B. Programme codes and definition

UG Programmes

S.N.	Programme Name	Code
1	Chemical Engineering	CH
2	Civil Engineering	CE
3	Computer Science and Engineering	CS
4	Electrical Engineering	EE
5	Electronics and Telecommunication Engineering	EC
6	Information Technology	IT
7	Instrumentation Engineering	IN
8	Mechanical Engineering	ME
9	Production Engineering	PE
10	Textile Technology	TT

C. Course code and definition

Definition	Course Code
Lecture	L
Tutorial	T
Practical	P
Credit	C
Basic Science Course	BSC
Engineering Science Course	ESC
Programme Core Course	PCC
Multidisciplinary Minor	MDM
Generic/ Open Electives	OE
Vocational Skill and Skill Enhancement Courses	VSEC
Vocational Skill Course	VSC
Skill Enhancement Courses	SEC
Ability Enhancement Courses	AEC
Indian Knowledge System	IKS
Value Education Courses	VEC
On Job Training: Internship/ Apprenticeship	OJT
Field Projects	FP
Community Engagement Project	CEP
Co-curricular Courses	CC
Research Methodology	RM
Research Project	RP
Liberal Learning Course	Lib. Learn
Humanities, Social Science, and Management	HSSM

Content

S.N.	Course Code	Course Title
Basic Science Courses		
1	BSC-101	Physics
2	BSC-102	Chemistry
3	BSC-103	Mathematics-I
4	BSC-104	Mathematics-II
5	BSC-105	Biology for Engineers
Engineering Science Courses		
6	ESC-101	Basic Electrical Engineering
7	ESC-103	Programming for Problem Solving
8	ESC-102	Engineering Graphics and Design
Programme Core Courses		
9	PCC-XX-102	Programme Core Course
Vocational Skill and Skill Enhancement Courses		
10	VSEC-101	Engineering Exploration
Co-curricular Courses		
11	CC-101	Yoga and Sports
Ability Enhancement Courses		
12	AES-102	Professional communication
Indian Knowledge System		
13	IKS-102	Introduction to Indian Knowledge System
Liberal Learning Course		
14	CC-102	A. Photography B. Dramatics

Curriculum Structure from the Academic Year 2023-24

STRUCTURE A

Semester-I

S. N.	Course Code	Course Title	L	T	P	Cr
1	BSC-101	Physics	3	0	2	4
2	BSC-103	Mathematics-I	3	1	0	4
3	BSC-105	Biology for Engineers	2	0	0	2
4	ESC-101	Basic Electrical Engineering	3	0	2	4
5	ESC-103	Programming for Problem Solving	3	0	2	4
6	VSEC-101	Engineering Exploration	0	0	4	2
7	CC-101	Yoga and Sports	1	0	2	2
		Total	15	1	12	22

Semester-II

S. N.	Course Code	Course Title	L	T	P	Cr
1	BSC-102	Chemistry	3	0	2	4
2	BSC-104	Mathematics-II	3	0	0	3
3	ESC-102	Engineering Graphics and Design	2	0	4	4
4	AES-102	Professional Communication	2	0	2	3
5	PCC-XX-102	Programme Core Course	3	0	2	4
6	IKS-102	Introduction to Indian Knowledge System	2	0	0	2
7	CC-102	(A) Photography (B) Dramatics	1	0	2	2
		Total	16	0	12	22

STRUCTURE B

Semester-I

S. N.	Course Code	Course Title	L	T	P	Cr
1	BSC-102	Chemistry	3	0	2	4
2	BSC-104	Mathematics-I	3	1	0	4
3	ESC-102	Engineering Graphics and Design	2	0	4	4
4	AES-102	Professional Communication	2	0	2	3
5	PCC-XX-102	Programme Core Course	3	0	2	4
6	IKS-102	Introduction to Indian Knowledge System	2	0	0	2
7	CC-102	(A)Photography (B)Dramatics	1	0	2	2
		Total	16	1	12	23

Semester-II

S. N.	Course Code	Course Title	L	T	P	Cr
1	BSC-101	Physics	3	0	2	4
2	BSC-103	Mathematics-II	3	0	0	3
3	BSC-105	Biology for Engineers	2	0	0	2
4	ESC-101	Basic Electrical Engineering	3	0	2	4
5	ESC-103	Programming for Problem Solving	3	0	2	4
6	VSEC-101	Engineering Exploration	0	0	4	2
7	CC-101	Yoga and Sports	1	0	2	2
		Total	15	0	12	21

Note: PCC-XX-102, the programme Core Course, will be offered department-wise.

S. N.	Programme Name	Course Name	Code
1	Chemical Engineering	Chemical Process Calculations	PCC-CH-102
2	Civil Engineering	Elements of Civil Engineering and Mechanics	PCC-CE-102
3	Computer Science and Engineering	Computer fundamentals	PCC-IT/CS-102
4	Electrical Engineering	Basic Electronics	PCC-EC/IN/EE -102
5	Electronics and Telecommunication Engineering	Basic Electronics	PCC-EC/IN/EE -102
6	Information Technology	Computer fundamentals	PCC-IT/CS-102
7	Instrumentation Engineering	Basic Electronics	PCC-EC/IN/EE -102
8	Mechanical Engineering	Elements of Mechanical and Production Engineering	PCC-ME/PE-102
9	Production Engineering	Elements of Mechanical and Production Engineering	PCC-ME/PE-102
10	Textile Technology	Basics of Textile and Garment Manufacturing	PCC-TT-102

Physics

Course Code	BSC-101			
Category	Basic Science Course			
Course Title	Physics			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	3	0	2	4

Course Objectives:

1. This course provides an introduction and in-depth examination to wave models of optical propagation. This class considers properties and behaviour of light in conditions when the wave nature of light becomes dominant.
2. This course will develop familiarity with the physical concepts and facility with the mathematical methods of quantum mechanics.
3. This course will cultivate skills for formulating and solving physics problems.
4. This course will provide students with a background and understanding of the fundamentals of the solid-state physics.

Course Content:

Unit 1: Particle Nature of Waves (07 hours)

Planck's quantum theory of light, Explanation of laws of photoelectric emission in terms of quantum nature of light. Compton effect again in terms of quantum nature of waves.

Unit 2: Wave Nature of Particles (07 hours)

De Broglie's concept of matter waves, Davisson -Germer experiment, G. P. Thomson's experiment and Numericals.

Unit 3: Wave Optics (08 hours)

Huygens's principle, superposition of waves and interference of light, young's double slit experiment, Newton's rings, Michelson interferometer, Mach-Zehnder interferometer. Fraunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.

Unit 4: Quantum Mechanics (08 hours)

Fundamental difference between Newtonian mechanics and quantum mechanics, Uncertainty principle, Derivation of wave equation propagating along a stretched string and its solution. The wave functions. Requirements that must fulfil. Schrodinger equation (time dependent and steady-state form in one and three dimensions) expectation values, operators, Eigen values, Eigen functions. Particle in a one-dimension rigid box i) energy quantization, ii) Wave function & iii) momentum quantization.

Unit 5: Physics of Semiconductors (07 Hours) Fermi level in intrinsic semiconductors, Expression for concentration of electrons in conduction band, Holes concentration in valance band (only mention the expression), Conductivity of semiconductors (derivation), Hall effect, and Expression for Hall coefficient (derivation).

Unit 6: Introduction to Solids (08 hours)

Free electron theory of metals, Fermi level, density of states, Application to white dwarfs and neutron stars, Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands, Numerical solution for energy in one-dimensional periodic lattice by mixing plane waves.

References:

1. Serway, Moses, and Moyer," Modern Physics", Cengage Learning, 3rd Edition (2004)
2. Resnick and Eisberg, "Quantum Mechanics of Atoms, Molecules, Solids, Nuclei", 2nd Edition, Wiley Student Edition (1985)
3. J. D. Griffith, "Introduction to Quantum Mechanics", 2nd Edition, Pearson Publication (1983).
4. C. Kittel, "Introduction to Solid State Physics", 7th Edition, Wiley Student Edition (1996)
5. Ashcroft and N. D. Mermin, "Solid State Physics", 10th Edition, Philadelphia, Pa: Saunders College (1976)
6. S. M. Sze, "Introduction to Semiconductor Devices", 3 rd Edition, Wiley Inter science (2002).
7. M. V. Avadhanulu, P. G. Kshirsagar, "A Textbook of Engineering Physics", Revised Edition, S. Chand Publisher (2004)
8. https://archive.nptel.ac.in/courses/115/101/115101107/

List of Experiments:

1. To determine the conductivity of graphite rod.
2. Measurement of energy band gap of semiconductor by four probe method.
3. To determine the velocity of ultrasonic sound by using ultrasonic interferometer
4. To study Hall Effect and calculate hall coefficient and carrier charge density.
5. To determine laws of photoelectric effect.
6. Millikan's oil drop experiment.
7. Solar cell characteristics.
8. To study PN junction diode characteristics
9. To study Zener diode characteristics.
10. Determination of wavelength of laser by using Michelson's interferometer.
11. To determine wavelength of sodium light by using diffraction grating.
12. Determination of specific rotation of sugar solution by Polari meter.
13. Measurement of Numerical aperture of fibre optics by scanning method.
14. Measurement of bending losses inside the fibre

Course Outcomes:

After completing this course student will be able to.

CO1**.** Understand basic concepts of Modern/ Microscopic/ Macroscopic theory of physics.

CO2. Wave nature of particles, particle natures of waves/ wave particle duality.

CO3. To explain some fundamental experiments of physics, foundation as well as Comprehensive background of Quantum mechanics.

CO4.Few fundamental properties of atoms, molecules, and solids (metals, Semiconductors, and technologically important materials

Mathematics I

Course Code	BSC-103			
Category	Basic Science Course			
Course Title	Calculus and Linear Algebra			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	3	1	0	4

Course Objectives:

1. To study basic concepts of differentiation and integration of one variable function and apply them to solve problems in engineering and other real-life problems.
2. To study different techniques of solving ordinary differential equations.
3. To solve system of linear equations using matrices and their use to find eigenvectors and eigenvalues of a matrix.
4. To study applications of dominant eigenvectors and eigenvalues in engineering problems.

Course Content:

Unit 1: Single-variable Calculus -(Differentiation) (12 hours)

Rolle's theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima, Polar Coordinates**,** polar curves, angle between the radius vector and tangent, angle between two curves. Pedal equations. Curvature and Radius of curvature, Application of radius of curvature in engg. Evolutes and involutes. envelopes, asymptotes, singular points, cusp, node and conjugate points.

Unit 2: Single-variable Calculus (Integration) (08 hours)

Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Unit 3: Ordinary differential equations of higher orders (08 hours)

Second order linear differential equations, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Unit 4: Linear Algebra (12 hours)

Elementary row transformation of a matrix, Rank of a matrix. Consistency and solution of a system of linear equations - Gauss-elimination method, Gauss-Jordan method. Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector, orthogonality.

References:

1. C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics" McGraw – Hill Book Co., New York, 6th Ed., (2017)
2. James Stewart: "Calculus" Cengage Publications, 7th Ed., (2019)

3. David Poole, “A modern Introduction, Brooks/Cole publications, (2014)
4. G. Strang, “Linear Algebra and Its Applications”, 4th Edition, Thomson Learning Academic Resource Centre, USA (2006))
5. E. Kreyszig, “Advanced Engineering Mathematics”, 9th edition, John Wiley and Sons Inc., USA (2006)
6. Courses offered by NPTEL - https://nptel.ac.in/?disciplineid=111

Course Outcomes:

Students will be able to:

CO1. Understand the concepts of derivatives and apply the knowledge of differentiation to solve problems related to polar curves, radius of curvature and related engineering problems.

CO2. Learn the definite and improper integrals and apply the notion to engineering problems.

CO3. Learn the notion of ordinary differential equations and use them in electric circuit problem, communication, optimization, etc.

CO4. Make use of matrix theory for solving for system of linear equations and compute eigenvalues and eigenvectors and solve the problems related to his engineering field in data science, electrical, mechanical, chemical process, optimization, etc.

Biology for Engineers

Course Code	BSC-105			
Category	Basic Science Course			
Course Title	Biology for Engineers			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	2	0	0	2

Course Objectives:

1. Introduction to basics of biology which includes cell, the unit of life, different types of cells, classification of living organisms.
2. Understanding what are biomolecules present in a cell, the structures function, and their role in a living organism.
3. Application of a certain biomolecules in an industry
4. How biology can be applied in our daily life using different technology for production of medicines to transgenic plants and animals to designing new biological products

Course Content:

Unit 1: Introduction to Basic Biology (05 hours)

Cell: What is a Cell, Cell theory, Cell shapes, structure of a Cell, Cell cycle chromosomes The Plant Cell and animal Cell, protoplasm, prokaryotic and eukaryotic Cell, Plant Tissue and Animal Tissue. Brief introduction to five kingdoms of classification.

Unit 2: Introduction to Bio-molecules (05 hours)

Carbohydrates, proteins, Amino acid, nucleic acid (DNA and RNA) and their types.

Enzymes and their application in Industry. Large scale production of enzymes by Fermentation

Unit 3: Genes, Replication of DNA, And Introduction to recombinant DNA Technology(06 hours)

Prokaryotic gene and Eukaryotic gene structure, gene replication, Transcription and Translation in Prokaryote and Eukaryote and synthesis of protein in Eukaryotes. Recombinant DNA technology and cloning introduction.

Unit 4: Human Physiology(04 hours)

Nutrition (Classes of nutrients or food substances), Digestive systems, Respiratory system (two kinds of respiration – aerobic and anaerobic) Respiratory organs, respiratory cycle. Excretory system

Unit 5: Enzymes Purpose (04 hours)

To convey that without catalysis life would not have existed on earth Enzymology: How to monitor enzyme catalyzed reactions. How does an enzyme catalyze reactions? Enzyme classification. Mechanism of enzyme action.

Unit 6: Application of Biology (06 hours)

Brief introduction to Production of vaccines, Enzymes, antibodies, Cloning in microbes, plants and animals, Basics of biosensors, biochips, Bio fuels, and Biosensors. What is Tissue engineering? And its application, transgenic plants and animals, Bio engineering (production of artificial limbs, joints and other parts of body).

References:

1. General Biology, Uma Devi Koduru, Khanna Book Publishing Company.
2. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd

3. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons
4. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
5. Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
6. Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

Course Outcomes:

Students will be able to:

CO1. Define the cell, its structure, function and different types of cells and basis for classification of living organism.

CO2. Explain about biomolecules its structure and function and their role in a living organism, how biomolecules are useful in industry.

CO3. Demonstrate the concept of biology and its uses in combination with different technologies for production of medicines and production of transgenic plants and animals.

CO4. illustrate about genes and genetic materials(DNA and RNA) present in living organism and how they replicate transfer and preserve vital information in living organism

CO5. Classify enzymes and distinguish between different mechanisms of enzyme action

Basic Electrical Engineering

Course Code	ESC-101			
Category	Engineering Science Course			
Course Title	Basic Electrical Engineering			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	3	0	2	4

Course Objectives:

1. To inculcate in students basic ideas and principle of electrical engineering.
2. To impart knowledge of electrical circuits and basic working principle used in electrical.
3. Familiarize students with protection equipment and lighting schemes in day to day life.

Course Content:

Unit 1: Elementary Concept (06 hours)

Concepts of e.m.f, potential difference & current, battery. Energy Sources: Ideal and practical voltage and current sources, independent and dependent sources.

Unit 2: DC Circuits (06 hours)

Ohm's law, Kirchhoff's laws, simplification of networks using series - parallel combinations and star - delta transformations, Current and Voltage division rule, Mesh Analysis, Nodal Analysis, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum power transfer theorem.

Unit 3: Electromagnetism (08 hours)

Magnetic effect of electric current, cross and dot conventions, right hand thumb rule, basic definitions of magnetic circuits, comparison of electrical and magnetic circuit, force on current carrying conductors placed in magnetic field, Fleming's left hand rule. B-H curve .Faraday's laws of electromagnetic induction, Fleming'sright hand rule, statically and dynamically induced e.m.f., self and mutual inductance, coefficient of coupling, energy stored in magnetic field.

Unit 4: AC Fundamentals (10 hours)

Sinusoidal voltages and currents, their mathematical and graphical representation, Basic definitions of AC fundamentals. Phase difference, lagging, leading and in phase quantities and phasor representation. Rectangularand polar representation of phasors. Study of A.C. circuit consisting of pure resistance, pure capacitance, pure inductance and corresponding voltage- current phasor diagrams, voltage-current waveforms. Single phase A.C. circuits: Study of series and parallel R-L,R-C.R-L-C circuits, concept of impedance, admittance in case of above combinations, waveform and relevant voltage - current phasor diagrams, concept of active, reactive, apparent, complex power and power factor Three phase balanced circuits, Voltage and current relations in star and delta connections.

Unit 5: Transformers (05 hours)

Construction, Theory of operation, Ideal and practical transformer, Open circuit test, Short-circuit test, Efficiency and Voltage Regulation.

Unit 6: Basic Electrical Measuring Instruments (05 hours)

Working principle of Permanent Magnet Moving Coil (PMMC) meters, Basic voltmeter, ammeter, wattmeter,multimeter and energy meter, Tachogenrators and stroboscope.

References:

1. Hughes Edward, *Electrical and Electronic Technology*, VIII Edition, Pearson Education, NewDelhi, (2010).
2. Vincent Del Toro, *Electrical Engineering Fundamentals*, 2nd Edition, Pearson Education, NewDelhi, (1989).
3. B. L. Theraja and A.K. Theraja, *A Text Book of Electrical Technology,* Volume I and II, S. Chandand company Ltd. New Delhi (2004).
4. D. P. Kothari, I. J. Nagrath, *Basic Electrical Engineering*, 3rd edition, TMH Publishing Co. Ltd.,New Delhi (2010).
5. Kulshresta D.C., *Basic Electrical Engineering*, TMH India (2009).
6. Mittle and Mittal, *Basic Electrical Engineering,* TMH India (2005).
7. youtube.com/playlist?list=PLbRMhDVUMngfdEXVcdf_ijj2Eub-UHs_y
   By Prof. Debapriya Das (IIT Kharagpur), Fundamental of Electrical engineering.

List of Experiments:

1. Study of electrical symbols, safety and precaution.
2. Study of house wiring and cables.
3. Study and Verification of Kirchhoff's laws.
4. Study and Verification of Superposition.
5. Study and Verification of Thevenins Theorem and Norton's Theorem.
6. Study and Verification of Maximum power transfer Theorem.
7. Measurement of Steady state and transient response on R-L, R-C, R-L-C circuits.
8. Study of AC series R-L-C circuits.
9. Study of AC parallel R-L-C circuits.
10. Study of PMMC meter.
11. Study of Earthing.
12. Study of different electrical component and there specification.
13. Study of balanced 3-phase star circuit.
14. Study of balanced 3-phase delta circuit.
15. Study of MCB and ELCB.
16. Study of basic electrical element.

Course Outcomes:

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

CO1. Analyze DC electric circuits.

CO2. Understand basics of electromagnetism.

CO3. Apply the knowledge for Solving AC circuits.

CO4. Explain working and applications of transformers.

CO5. Gain knowledge of principle and working of various measuring instruments.

Programming for Problem Solving

Course Code	ESC-103			
Category	Engineering Science Course			
Course Title	Programming for Problem Solving			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	3	0	2	4

Course Objectives:

1. To learn the problem-solving techniques writing algorithm and flowchart.
2. To learn the fundamentals of computer organization, syntax, and semantics for C programming language
3. To learn to write, compile and debug programs (C language)
4. To introduce the constructs of structured programming.

Course Content:

Unit 1: Introduction to Programming (08 hours)

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo code with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, syntax and logical errors in compilation, object, and executable code.

Unit 2: Arithmetic expressions and precedence (04 hours)

Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching, Iteration, and loops.

Unit 3: Arrays (06 hours)

Arrays (1-D, 2-D), Character arrays and Strings. Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required).

Unit 4: Function (08 hours)

Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference, Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Unit 5: Structure (08 hours)

Structures, Defining structures and Array of Structures.

Unit 6: Pointers (06 hours)

Idea of pointers, defining pointers, use of pointers in self-referential structures, notion of linked list (no implementation), File handling (only if time is available, otherwise should be done as part of the lab).

References:

1. Herbert Schidt, *C: The complete reference*, 4th edition, McGraw Hill publication.

2. Brian W. Kernighan and Dennis M. Ritchie, *The C Programming Language*, Prentice Hall of India.

List of Experiments:

1. Problem solving using computers. Study of following Concepts:
    a. Computer architecture.
    b. Algorithm with examples.
    c. Flowchart with examples
2. Simple computational problems using arithmetic expressions. Study of Operators in C. Write C programs using:
    a. Arithmetic operators.
    b. Assignment operator.
    c. Relational operators.
    d. Logical operators.
    e. Bitwise operators.
    f. Conditional operators.
    g. Increment/decrement operators.
    h. sizeof () operator (to find size of int, float, double, char).
3. Problems involving if-then-else structures.
    a. Write a C program to check whether a person is eligible for voting or not.
    b. Write a C program to calculate electricity bill. Read initial and final meter readings. Calculate consumed units. Apply rate as follows:

No. of unit consumed	Rate in rupees
0 – 100	3.45
101 – 250	4.50
251 – 400	5.35
401 – 500	5.95
Above 500	6.70

    c. Write a c program to calculate the salary of salesperson based on total sales. The bonus and incentives offered to him will be based on total sales. If sales exceed Rs. 80000/- follow the particulars of table-1 otherwise table-2.

Table-1

Basic	9000
HRA	25% of basic
DA	120% of basic
Incentives	15% of sales
Bonus	3000

Table-2

Basic	7000
HRA	18% of basic
DA	95% of basic
Incentives	8% of sales
Bonus	1500

4. Loops, while and for loops.
    a. Write a C program to find sum of natural number up to n terms.
    b. Write a C program to find factorial of an entered number.
    c. Write a C program to find sum of digits of a number.
    d. Write a C program to check whether a number is palindrome or not.
    e. Write a C program to check whether the input number is Armstrong number or not.

5. 1D Array manipulation:
    a. Write a C program to find the largest element of an array.
    b. Write a C program to input elements in array and sort array elements in ascending or descending order.
    c. Write a C program for Bubble, Insertion and Selection sort.
6. Matrix problems:
    a. Write a C Program to add two matrix using two-dimensional arrays.
    b. Write a C Program to multiply to matrix using two-dimensional arrays.
    c. Write a C Program to find transpose of matrix.
    d. Write a C Program to trace of matrix.
7. String operations:
    a. C Program to Find the Length of a String.
    b. C Program to Find the Frequency of Characters in a String.
    c. C Program to Find the Number of Vowels, Consonants, Digits and White space in a String.
8. Simple functions:
    a. Write a C program to find square of number using function. Write a C program for swapping of two numbers using.
    b. Call by value.
    c. Call by reference.
9. Programming for solving Numerical methods problems:
    a. C Program to Solve any Linear Equation in One Variable.
    b. C Program to find all Roots of a Quadratic Equation.
10. Recursive functions:
    a. Write a C program to find factorial of an entered number using recursion.
    b. Write a C program to check whether the entered number is Prime or not using recursion.
    c. Write a C program to generate n terms of Fibonacci series using recursion.
11. Pointers and structures:
    a. Write a program in C to store n elements in an array and print the elements using pointer.
    b. Write a program in C to compute the sum of all elements in an array using pointers.
    c. Study of structure in C and a simple C program to print id, name, and percentage of on student using structure.
    d. Write a C Program save and print student's information (Student name, Id, Percentage) using structure.
    e. Write a program in C to show the usage of pointer to structure.
12. File operations: Basics of File Handling in C (C Program for basic file operations):
    a. Creation of a new file (fopen with attributes as "a" or "a+" or "w" or "w++")
    b. Opening an existing file (fopen)
    c. Reading from file (fscanf or fgetc)
    d. Writing to a file (fprintf or fputs)
    e. Moving to a specific location in a file (fseek, rewind)

f. Closing a file (fclose)

Laboratory Outcomes:

1. **T**o formulate algorithms for simple problems.
2. To translate given algorithms to a working and correct program.
3. To be able to correct syntax errors as reported by the compilers.
4. To be able to identify and correct logical errors encountered at run time.
5. To be able to write iterative as well as recursive programs.

Course Outcomes:

The student will learn-

CO1. To formulate simple algorithms for arithmetic and logical problems.

CO2. To translate the algorithms to programs (in C language).

CO3. To test and execute the programs and correct syntax and logical errors.

CO4. To implement conditional branching, iteration, and recursion.

CO5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.

Engineering Exploration

Course Code	VSEC-101			
Category	Vocational Skill and Skill Enhancement Course			
Course Title	Engineering Exploration			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	0	0	4	2

Course Objectives:

1. To learn skills associated with the tools and inventory associated with the Engineering Exploration and IDEA Lab.
2. To learn concepts of innovation including design thinking and go through the concept of a typical multidisciplinary group project.
3. To learn useful mechanical and electronic fabrication processes in multidisciplinary way.
4. To learn necessary skills to build prototypes of useful and standalone system/project with enclosures.
5. To learn important skills to create print and electronic documentation for the system/project.

Course Content:

Unit 1: Introduction to Engineering, Engineering Study and Ethics (04 hours)

Difference between science and engineering, Needs and wants of scientist and engineer; Various disciplines of engineering, Some misconceptions of engineering; Expectation for the 21st century engineer and graduate attributes**;** Engineering Ethics (Identifying Engineering as a Profession, Significance of professional ethics, Code of conduct for engineers, Identifying ethical dilemmas in different tasks of engineering, Applying moral theories and codes of conduct for resolution of ethical dilemmas); Introduction to sustainability (Sustainability leadership, Life cycle assessment, Carbon foot print).

Unit 2: Innovation Cycle and Engineering Design (04 hours)

Introduction to Innovation Cycle; Typical Design Thinking process; Engineering Design Process; Multidisciplinary facet of design; Pair wise comparison chart; Introduction to mechatronics system; generation of multiple solution; Pugh Chart; Motor and battery sizing concepts.

Unit 3 : Basic components of a typical Multidisciplinary Project(16 hours)

Degrees of freedom or mobility of a mechanism, 4 bar chain, crank rocker mechanism, slider crank mechanism; Simple robotic arm building; Understanding electronic system design flow; Electronic circuit building blocks including common sensors, transducers, actuators, LEDs, Displays, Relays, etc.; Introduction to various platform-based development (Arduino/ Raspberry Pi/etc.) programming and its interfacing; Solar panels, battery types and charging/discharging; Importance and basics of IPR and patents, Accessing and utilizing patent/copyrights information.

Unit 4: Familiarization to Tools, Basic measurement instruments and equipment (04 hours)

Tape measure, combination square, Vernier caliper, hammers, fasteners, wrenches, pliers, saws, tube cutter, chisels, vice and clamps, tapping and threading; Adhesives, Power saws, band saw, jigsaw, angle grinder, belt sander, bench grinder, rotary tools; Various types of drill bits; DMM, DSO, Signal generator, function generator, Power supply, etc.

Unit 5: Circuit prototyping, Introduction to 2D/3D design and PCB design (06 hours)

Circuit prototyping using breadboard, Zero PCB, and 'Manhattan' style; Single, double and multilayer PCBs; Single and double-sided PCB prototype fabrication; Soldering using soldering iron/station. Basic 2D and 3D designing using CAD tools such as FreeCAD, Sketchup, Prusa Slicer, FlatCAM, Inkspace, OpenBSP and VeriCUT; Schematic design and PCB layout and Gerber creation using EagleCAD.

Unit 6: 3D printing and prototyping, Mechanical cutting and engraving (06 hours)

3D printing using FDM, SLS and SLA; Basics of 3D scanning, point cloud data generation for reverse engineering; Prototyping using subtractive cutting processes; 2D and 3D Structures for prototype building using Laser cutter and CNC routers; 3-axis CNC routing, basic turning, milling, drilling and grinding operations; Laser cutting, Laser engraving, etc

Unit 7: Introduction to Project Management (06 hours)

Introduction to Agile practices, Significance of teamwork, Importance of communication in engineering profession; Types of Data, Descriptive Statistics techniques as applicable to different types of data, Types of graphs as applicable to different types of data, Usage of Microsoft Excel tool for descriptive statistics, Exporting acquired data to Microsoft Excel and analysis using visual representation; Project management tools – Checklist, Timeline, Gantt chart, Significance of documentation; Documentation using Doxygen, Google Docs, Overleaf. Version control tools - GIT and GitHub.

Unit 8: Course project (14 hours)

Discussion and implementation of a course project in a group; Documentation of the course project (report and video).

References:

1. Chris Hackett,"The Big Book of Maker Skills: Tools & Techniques for Building Great Tech Projects", Weldon Owen
2. Sean Michael Ragan, "The Total Inventors Manual (Popular Science): Transform Your Idea into a Top-Selling Product", Weldon Owen
3. Paul Sherz and Simon Monk, "Practical Electronics for Inventors. 4th edition", McGraw Hill
4. Platt, Charles, "Make: Tools: How They Work and How to Use Them", Shroff/Maker Media
5. Paul Horowitz and Winfield Hill, "The Art of Electronics. 3rd edition", Cambridge University Press
6. Dr. Sabrie Soloman, "3D Printing & Design," Khanna Book Publishing Company, New Delhi
7. Charles Platt, "Encyclopedia of Electronic Components (Volume 1, 2 and 3)", Shroff Publishers
8. Simon Monk, "Programming Arduino: Getting Started with Sketches. 2nd edition", McGraw Hill
9. Simon Monk and Duncan Amos, "Make Your Own PCBs with EAGLE: From Schematic Designs to Finished Boards", McGraw Hill Education
10. Scott Chacon and Ben Straub, "Pro GIT, 2nd edition", Apress
11. Venuvinod, PK., MA. W., "Rapid Prototyping – Laser Based and Other Technologies", Kluwer
12. Ian Gibson, David W Rosen, Brent Stucker., "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer
13. Sayyed Khandani, "Engineering Design Process", https://www.uoguelph.ca/engineering/sites/uoguelph.ca.engineering/files/public/EngineeringProcess.pdf
14. Luca P. Carloni, Fernando De Bernardinis, Claudio Pinello, Alberto L. Sangio-

vanni-Vincentelli, and Marco Sgroi, “Platform-Based Design for Embedded Systems, the Embedded Systems Handbook”

Laboratory Activities:

1. Simple innovative activities/experiments.
2. Simple mechanisms using Software simulators.
3. Use of measuring tools and equipment.
4. Electronics Circuit Design using simulators and breadboards.
5. Embedded programming using Arduino and/or Raspberry Pi including interfacing with typical sensors/transducers and actuators/LED/Display/etc.
6. Schematic and PCB layout design of a suitable circuit, fabrication and testing of the circuit.
7. 2D profile cutting of press fit box/casing in acrylic/cardboard/MDF using laser cutter & engraver.
8. 3D scanning of computer mouse geometry surface and 3D printing of scanned geometry using FDM or SLA printer.
9. Machining of 3D geometry on soft material such as soft wood or modelling wax.
10. Use of project management tools.
11. Documentation of project.
12. Course project (Design and implementation of a project involving embedded hardware, software and machined or 3D printed enclosure)

Course Outcomes:

At the end of the course, the students will be able to:

CO1. Know the concepts of engineering, engineering ethics and concerns of modern-day engineers performing the role of as a problem solver by understanding innovation cycle, design thinking, engineering design, multidisciplinary group project, and intellectual property.

CO2. Understand basic tools and instruments necessary to implement a typical multidisciplinary project.

CO3. Understand concepts of an electronic project design using circuit building blocks like sensors, transducers, actuators, LEDs, Displays, and typical processors like Arduino.

CO4. Understand and perform 2D/3D design, 2D/3D CNC machining, 3D printing, laser cutting and engraving, and PCB designing.

CO5. Understand basics of engineering project management skills and implement a typical multidisciplinary group project with its documentation.

Yoga and Sports

Course Code	CC-101			
Category	Co-curricular Course			
Course Title	Yoga and Sports			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	1	0	2	2

Course Objectives:

1. To make the students understand the importance of sound health and fitness principles as they relate to better health.
2. To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness.
3. To create a safe, progressive, methodical and efficient activity based plan to enhance improvement and minimize risk of injury.
4. To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health.

Course Content:

Unit I: Introduction to Physical Education (**1 hour**)

- Meaning and definition of Physical Education
- Aims and objectives of Physical Education
- Changing trends in Physical Education

Unit II: Olympic Movement (2 hours)

- Ancient and Modern Olympics (Summer and Winter)
- Olympic Symbols, Ideals, Objectives and Values
- Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.)

Unit III: Physical Fitness, Wellness & Lifestyle(2 hours)

- Meaning and Importance of Physical Fitness & Wellness
- Components of Physical fitness
- Components of Health related fitness
- Components of wellness
- Preventing Health Threats through Lifestyle Change
- Concept of Positive Lifestyle

Unit IV: Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga (2 hours)

- Define Anatomy, Physiology & Its Importance
- Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.)

Unit V: **Kinesiology, Biomechanics & Sports((2 hours)**

- Meaning & Importance of Kinesiology & Biomechanics in Physical Edu.

& Sports

- Newton's Law of Motion & its application in sports.
- Friction and its effects in Sports.

Unit VI :Postures (01 hours)

- Meaning and Concept of Postures.
- Causes of Bad Posture. o Advantages & disadvantages of weight training.
- Concept & advantages of Correct Posture.
- Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis.
- Corrective Measures for Postural Deformities

Unit VII: Yoga (1 hours)

- Meaning and Importance of Yoga o Elements of Yoga
- Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas
- Yoga for concentration and related Asanas (Sukhasana; Tadasana; Padmasana & Shashankasana)
- Relaxation Techniques for improving concentration - Yog-nidra

Unit VIII: **Yoga and Lifestyle (2 hours)**

- Asanas as preventive measures.
- Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana.
- Obesity: Procedure, Benefits and contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana.
- Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.
- Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardh Matsyendrasana.
- Asthema: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.

Unit IX: **Training and Planning in Sports(1 hours)**

- Meaning of Training
- Warming up and limbering down o Skill, Technique & Style
- Meaning and Objectives of Planning.
- Tournament – Knock-Out, League/Round Robin and Combination.

Unit X: Psychology & Sports o Definition & Importance of Psychology in Physical Edu. & Sports (1 hours)

- Define & Differentiate Between Growth & Development
- Adolescent Problems & Their Management
- Emotion: Concept, Type & Controlling of emotions
- Meaning, Concept & Types of Aggressions in Sports.
- Psychological benefits of exercise.
- Anxiety & Fear and its effects on Sports Performance.

- Motivation, its type & techniques.
- Understanding Stress & Coping Strategies.

Unit XI: Doping (1 hour)

- Meaning and Concept of Doping
- Prohibited Substances & Methods
- Side Effects of Prohibited Substances

Unit XII: Sports Medicine (01 hours)

- First Aid – Definition, Aims & Objectives.
- Sports injuries: Classification, Causes & Prevention.
- Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries

Unit XIII: Sports / Games Following subtopics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc.

- History of the Game/Sport.
- Latest General Rules of the Game/Sport.
- Specifications of Play Fields and Related Sports Equipment.
- Important Tournaments and Venues.
- Sports Personalities. Proper Sports Gear and its Importance.

References:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Light on Yoga By B.K.S. Iyengar.
3. Health and Physical Education – NCERT (11th and 12th Classes)

List of Experiment:

Students have to practise the different Asanas mentioned in the syllabus and study different sports.

Course Outcomes:

On successful completion of the course the students will be able;

CO1. To practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility, and relaxation.

CO2. To learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.

CO3. To learn breathing exercises and healthy fitness activities

CO4. To perform yoga movements in various combination and forms.

CO5. To assess current personal fitness levels.

CO6. To demonstrate an understanding of sound nutritional practices as related to health and physical performance.

Chemistry

Course Code	BSC-102			
Category	Basic Science Course			
Course Title	Chemistry			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	3	0	2	4

Course Objectives:

To impart basic Chemistry of Engineering materials to the upcoming engineers

Course Content:

Unit 1: Analytical Aspects of Water (07 hours.)

Impurities and their effects, Chemical analysis- Hardness [EDTA method], Chlorine content, Alkalinity- Numerical, Softening Methods — Lime Soda, Zeolites & ion Exchange, Desalination, need and awareness of conservation of water.

Unit 2: Fuels (07 hours.)

Classification of Fuels, calorific values, Deter:mination using Bomb calorimeter & Boy's calorimeter, Dulong's formula & numerical, Analysis of coal and significance, numerical. Boiler, troubles in boiler & their prevention.

Unit 3: Petroleum & Lubricants (07 Hrs.)

Refining of petroleum, Knocking, Octane number, Cetane number, Power alcohol, biodiesel, CNG,hydrogen as fuel. Types of Lubricants, Lubrication mechanism properties & their significance.

Unit 4: Corrosion & Spectroscopic Technique (07 hours.)

Theories involved and types of corrosion, factors affecting corrosion, Corrosion control methods.Principle of spectroscopy, electronic spectra (UV and Fluorescence), IR, NMR.

Unit 5: Electro-Chemistry & Polymer (07 hours)

Electrochemical and galvanic series, polymers classification and properties, rubber and its modifications,Biodegradable polymers, Conducting polymers and polymer composites.

Unit 6: Advanced Engineering Material (05 hours)

Glass, alloys, ceramics and refractories, cement, Nanomaterials, semiconductors, superconductor, optical fibres, fullerenes, organic electronic materials and Twelve Principles of green chemistry.

References:

1. P. C. Jain and M. Jain, *Engineering Chemistry,* 15'hEdition, Dhanpat Rai and sons (2006).
2. S. S. Dara & S. S. Umare, *Engineering Chemistry,* 12'h Edition, S. Chand and Com-pany Ltd.(2012).
3. S. K. Sing, *Fundamentals of Engineering Chemistry,* New Age International Publishers.
4. Shashi Chawla, *A Textb o o k of Engineering Chemistry,* 1" edition, Dhanpat Rai & co (2002).
5. C. N. Banwell, *Fundamentals of molecular Spectroscop y,* Snippet View, (1994).
6. Kuriacose, JC, Rajaram J, *Chemistry of Engineering and Technology , Vol. I and II,* McGraw Hill

(1984).
7. https://archive.nptel.ac.in/courses/122/101/122101001/
8. https://archive.nptel.ac.in/courses/122/106/122106028/
9. https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-cy02/
Course Name: Basics in Inorganic Chemistry, Prof. Debabrata Maiti

List of Experiments:

1. Determination of total hardness of water.
2. Determination of PH using PH-meter.
3. Proximate analysis of Coal (Ash determination).
4. Estimation of Chloride content in water.
5. Determination of dissolved Oxygen in water.
6. Determination of alkalinity in water.
7. Preparation of Urea — formaldehyde resin.
8. To determine coefficient of Viscosity of given solvent by Ostwald's Viscometer.
9. Determination of Acid value of lubricating Oil.
10. Determination of Chlorine in water.
11. Determination of Saponification value of oil.
12. Estimation of Iron in given Iron alloy sample.
13. Determination of aniline point of lubricating

Course Outcomes:

CO1. Students will be able to understand various industrial processes and products.
CO2. Enabling students to know about the relevant engineering materials, their chemistry and recenttechnology.
CO3. Outer world will be benefited with current scientific knowledge.
CO4. Students will be able to understand various analytical methods used for material analysis.
CO5. To strengthen the student's understanding to the related core subjects in their respective discipline.

Mathematics II

Course Code	BSC -104			
Category	Basic Science Course			
Course Title	Multivariable Calculus, Partial Differential Equations, Laplace Transforms			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	3	0	0	3

Course Objectives:

1. To study basic concepts of differentiation and integration of multi variable function and apply them to solve problems in engineering and other real-life problems.
2. To study method of finding Fourier series and its applications in solving Partial differential equations (PDE).
3. Solving heat equations, and wave equations using PDE.
4. To study Laplace transforms and their applications to solve ordinary differential equations and partial differential equation

Course Content:

Unit 1: Multivariable Calculus (Differentiation) (8 hours)

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima, and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

Unit 2: Multivariable Calculus (Integration)(10 hours)

Multiple Integration: Double integrals, change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Centre of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), orthogonal curvilinear coordinates, Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

Unit 3: Fourier Series (6 hours)

Periodic functions, Fourier series of functions with period 2π, change of interval, half range sine and cosine series.

Unit 4: Partial Differential Equations (PDEs) (08 hours)

Basic Concepts of PDEs, Modelling: Vibrating string, wave equations, solution by separating variables, use of Fourier series, D'Alembert's solution of the wave equation, Heat equation: solution by Fourier series.

Unit 5: Laplace Transforms (08 hours)

Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem, solving ODEs and PDEs by Laplace Transform method.

References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Eighth Edition, John Wiley and Sons, 2015.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Fifth Edition, Narosa Publishing House, 2016.
3. Walter A. Strauss, Partial Differential Equations an introduction, Wiley publication, 2008
4. https://nptel.ac.in/?disciplineid=111

Course Outcomes:

After completion of this course student will be able to

CO1**.** Apply the knowledge of multivariable calculus to solve problems related to data science, optimization, electrical, mechanical, chemical process.

CO2. Apply the concept of Fourier series and their application in system communication and digital signal processing, vibrations,

CO3. Examine the concept of partial differential equations to describe the heat and wave propagation phenomenon arising in fluid mechanics, electromagnetic theory, mechanical, and other engineering problems.

CO4. Use the knowledge of Laplace Transforms of customary functions arising in network analysis and control systems and solve ODE's and PDE's

Engineering Graphics and Design

Course Code	ESC-102			
Category	Engineering Science Course			
Course Title	Engineering Graphics and Design			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	2	0	4	4

Course Objectives:

1. To introduce students to the conventions, concepts, and basic principles of Engineering drawing.
2. To enable students to draw projections of geometrical objects and real-life components.
3. To enable students with the basic knowledge about CAD Software.

Course Content:

Unit 1: Introduction to Engineering Drawing (04 hours)

Introduction, Use of various drawing instruments, Lettering, Layout of drawing sheet, Sizes of the drawing sheets, Different types of lines used in the drawing practice, Dimensioning–Linear, Angular, Aligned system, Unidirectional system, Parallel dimensioning, Chain dimensioning, Location dimension and Size dimension, Concept of RF.

Unit 2: Projections of Points and Lines (05 hours)

Projections of points in all possible position w.r.t. reference planes, Projections of lines when it is perpendicular to one of the reference planes, when line is inclined to one and parallel to other reference plane, Line inclined to both reference planes, Applications of projection of lines and concept of traces of lines.

Unit 3: Projections of Planes and Solids (05 hours)

Projections of planes when it is parallel to one of the reference planes, lying in reference plane, when it is perpendicular to one and inclined to other reference plane, when it is inclined to both reference planes, Projections on auxiliary planes. Projection of solid when axis is perpendicular to one of the reference planes, when axis is inclined to one and parallel to other reference plane, when axis is inclined to both the reference planes, Projection of cube, right regular prisms, right regular pyramids, Right circular cylinder, Right circular cone, Tetrahedron, Frustum of solids.

Unit 4: Orthographic Projection (06 hours)

Multi view orthographic projections for parts/ patterns with isometric/ non-isometric surfaces and circular features and sectional views. Reading of orthographic projections.

Unit 5: Isometric Projection (06 hours)

Definition of isometric view, Projection, Isometric scale, non-isometric lines, Circular features in context of isometric projection. Construction of isometric view/ projection from given orthographic views.

Unit 6: Introduction to Computer Aided Drawing (04 hours)

Computer screen, Layout of the software, standard tool bar/ menus and description of

most commonly used tools bars, Navigational tools. Creation of 2D/3D environment. Commands and creation of coordinate points, lines, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, offset, mirror, rotate, trim, extend, break, chamfer, fillet, zoom, pan, curves, constraints viz. tangency, parallelism, inclination and perpendicular. Dimensioning, line conventions, lettering. Line properties, 3D modelling of basic solids and their intersections.

References:

1. N. D. Bhatt and V. M. Panchal, *Elementary Engineering Drawing*, 49th edition, Charotar Publisher (2011).
2. M. B. Shah and B. C. Rana, *Engineering Drawing,* Pearson Education (2005).
3. Jolhe Dhananjay, *Engineering Drawing with an introduction to Auto CAD,* 1st edition, Tata McGraw Hill Publishing Co. Ltd (2010).
4. P. J. Shah, *Engineering Graphics,* S. Chand Publication edition, New Delhi (2011-12).

List of Experiments:

Practical Evaluation: At least 4 assignments based on drafting work and at least 4 assignments based on AUTOCAD must be given on different topics.

Course Outcomes:

At the end of the course the students will be able to

CO1. Draw projections of point, line, plane and solid using the fundamental principles.

CO2. Read, interpret and draw orthographic projections.

CO3. Read, interpret and draw isometric projections.

CO4. Draft various Geometrical Elements used in Engineering Practice using CAD software.

Professional Communication

Course Code	AES-102			
Category	Humanities and Social Sciences and Management			
Course Title	Professional Communication			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	2	0	2	3

Course Objectives:

1. To enable students to learn the structure and style of effective sentences.
2. To enable students to express in English effectively.
3. To enhance students' Listening, Speaking, Reading & writing (LSRW) Skills.
4. To help students to understand nuances of technical writing.

Course Content:

Unit 1: Grammar & Vocabulary Building (10 hours)

1.1 Sentence Structures

1.2 Parts of Speech

1.3 Tenses

1.4 Voice

1.5 Introduction to phonetics (Sound system, phonetic transcription, stress etc.)

1.6 1.7 Reported Speech

1.8 The concept of Word Formation & Types

1.9 Root words from Foreign Languages and their use in English

1.10 Acquaintance with Prefixes and suffixes from Foreign Languages in English to form Derivatives.

1.11 Synonyms, Antonyms, One Word Substitute and Standard Abbreviations.

Unit 2: Identifying Common Errors in Writing (06 hours)

2.1 Tense

2.2 Concord

2.3 Conjunction

2.4 Articles

2.5 Prepositions

2.6 Gerund

2.7 Misplaced Modifiers

2.8 Redundancies

2.9 Clichés

Unit 3: Basic Writing Skills (08 hours.)

3.1 Paragraph (Use of phrases and clauses in sentences, Importance of proper punctuation, creating coherence, organizing principles of paragraphs in documents, Techniques for writing precisely).

3.2 Business Correspondence (Elements of Business Letters, Formats-Semi-block, Complete block, Modified block, Types of Letters-Enquiries, Reply to Enquiry, Order, Complaint, Adjustment).

3.3 Report Writing-Types of Reports, Formats –Memo & Letter.

3.4 Précis Writing.

Unit 4: Technical Writing (06 hours)

4.1 Framing Definitions, Writing Instructions, Description & Explanation

References:

1. Michael Swan, Practical English Usage, OUP (1995).
2. F.T. Wood, Remedial English Grammar, Macmillan (2007).
3. William Zinsser, On Writing Well, Harper Resource Book (2001).
4. Liz Hamp-Lyons and Ben Heasly, Study Writing, Cambridge University Press (2006).
5. Sanjay Kumar and PushpLata, Communication Skills, Oxford University Press (2011).
6. CIEFL, Hyderabad, Exercises in Spoken English. Parts. I-III, Oxford University Press.
7. Raymond Murphy, Essential English Grammar, CUP (2016).
8. Raymond Murphy, Intermediate English Grammar, CUP (2016).
9. R.C. Sharma & Krishnamohan, Business Correspondence & Report Writing, Tata McGraw Hill Education.
10. J. Sethi and. V. Dhamija, A Course in Phonetics and Spoken English, Prentice Hall of India Private Limited (2006).
11. https://onlinecourses.nptel.ac.in/noc20_hs19/preview , English Language for Competitive Exams By Prof. Aysha Iqbal, IIT Madras

List of Experiments:

Practical's (Oral Communication):

(This unit involves interactive practice sessions in Language Lab)

1. Listening Comprehension
2. Pronunciation, Intonation, Stress and Rhythm
3. Common Everyday Situations: Conversations and Dialogues
4. Communication at Workplace: Interviews, Formal Presentations.

Course Outcomes:

At the end of the course the students will be able to:

CO1. Acquire basic proficiency in English.

CO2. Listen, speak, read, and write effectively.

CO3. Express in English effectively.

CO4. Frame definitions, write instructions, and describe objects.

Chemical Process Calculations

Course Code	PCC-CH-102			
Category	Program Core Course			
Course Title	Chemical Process Calculations			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	3	1	0	4

Course Objectives:

1. To understand basic and fundamental chemical engineering calculations.
2. To know the unit systems, conversions.
3. To perform material balance and energy balance calculations on chemical process.

Course Content:

Unit 1: Basic Chemical Calculations (7 hours)

Overview of Chemical process industry and unit operations, Units and Conversions, Pressure, Temperature, Density, Specific Gravity; Mole Concept, Equivalent Weight, Composition of solids, Liquids and Gases, Mass fraction, Mass percent, Mass Ratios, Mole fraction, Mole percent, Volume fraction and Volume percent, Normality, Molarity , Molality

Unit 2: Gases Systems (7 hours)

Gaseous mixtures, Daltons law, Amagats law, Average molecular weight, Density of gaseous mixture, Estimation of vapour pressure. Humidity and saturation and their applications. Introduction to psychrometry humidity and air-conditioning calculations.

Unit 3: Material Balances without Chemical Reaction (7 hours)

Material balances; Guidelines for solving material balance problems; Material balance of important industrial operations (Distillation, Absorption and Striping, Extraction and Leaching, Evaporation, Dryer, Mixing, Crystallization etc.); Recycle and Bypass operations.

Unit 4: Material Balances with Chemical Reaction (6 hours)

Definition of terms involved; generalized approach for solving problems; Material balance problems involving chemical reaction; electrochemical reactions; Metallurgical applications; Recycle, bypass and purge calculations.

Unit 5: Energy Balance on Non-Reactive Processes (7 hours)

Elements of energy balance calculations; Change in pressure at constant temperature; Change in temperature; Phase change operations; Mixing and solutions, Thermo physics, Thermochemistry

Unit 6: Energy Balance on Reactive Processes (7 hours)

Heat of reaction; Measurement and calculation of standard heat of reaction, Hess law; Heat of formation; Heat of combustion; Effect of temperature on heat of reaction; adiabatic reactions, Combustion: Minimum air required, Excess air, Combustion calculation, Stoichiometry and Industrial problems.

References:

1. Stoichiometry by B. I. Bhatt &S. M. Vora; McGraw Hill Publication
2. Chemical Process Principles Part-1 by O.A. Hougen and K.M. Watson.
3. Chemical Process Principles Part-1 by R.A. Rastogi
4. Solved Examples in Chemical Engineering by G.K. Ray
5. Mass Transfer Operations by Treybal, Kogakusha Publication
6. Introduction to Chemical Engineering by Badger and Banchero, McGraw Hill PublicationUnit Operation of Chemical Engineering by McCabe and Smith; McGraw Hill Publication
7. Mass Transfer by Sherwood Pigford and Wilke, McGraw Hill Publication
8. Chemical Engineers Handbook by Perry and Chilton, McGraw Hill Publication
9. Mass Transfer Operations by Kiran D. Patil, Nirali Publication
10. NPTEL Course: Basic Principles and Calculations in Chemical Engineering
    By Prof. Subrata Kumar Majumdar | IIT Guwahati
    https://youtu.be/_ww0-IDidXM

List of Tutorials:

1. Determine the specific gravity of oil
2. Study of mixing process
3. Study the crystallizations
4. Determine the material balance and energy balance of material
5. Determine the calorific value
6. Study the Distillation column
7. Study the Absorption
8. Study the Striping,
9. Study the Extraction
10. Study the Leaching
11. Determine the humidity of air

Course Outcomes:

Students will able to ;

CO1. Know the basic concepts regarding unit systems and conversions in chemical engineering process.

CO2. to carry out the material balancing in chemical process involving chemical reactions and without chemical reactions.

CO3. to carry out the energy balancing in chemical process involving chemical reactions and without chemical reactions.

CO4. to provide solution to various unit operations.

Elements of Civil Engineering and Mechanics

Course Code	PCC-CE-102			
Category	Program Core Course			
Course Title	Elements of Civil Engineering			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	3	0	2	4

Course Objectives:

To make students learn the scope of various fields of civil engineering.

1. To develop students' ability to analyze the problems involving forces and moments with their applications.
2. To develop the student's ability to find out the center of gravity and moment of inertia and their applications.
3. To make the students learn about kinematics and kinetics and their applications

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Course Content:

Unit 1: Overview of Civil Engineering Systems and Building Materials (05 hours)

Introduction to structural engineering, geotechnical engineering, Construction technology, hydraulics, water resources and irrigation engineering transportation engineering, environmental and sanitary engineering, GIS, earthquake engineering. Role of civil engineers in the development of the nation. Building materials: Stone, brick, wood, glass, aluminum, cement, aggregates, concrete, steel, RCC, PSC, smart materials

Unit 2: Analysis of force systems (08 hours)

Concept of idealization, force, a system of forces, superposition, transmissibility, Resolution, and composition of forces, Law of Parallelogram of forces, polygonal law, Resultant of concurrent coplanar force system, coplanar non-concurrent force system, a moment of forces, couple, Varignon's theorem, resultant of coplanar non-concurrent force system, free body diagram, Lamis theorem, equations of equilibrium, equilibrium of concurrent and non-concurrent coplanar force system, Support reactions: Types of loads and types of supports, statically determinate and indeterminate beams, support reactions in beams, Numerical problems on support reactions for statically determinate beams (point load, udl, uniformly varying loads and moments)

Unit 3: Friction (07 hours)

Types of friction, laws of friction, limiting friction, coefficient of friction concept of static and dynamic friction, numerical problems on impending motion on horizontal and inclined planes along with connected bodies.

Unit 4 :Centroid (09 hours)

Introduction, methods of determining the centroid, locating the centroid of simple figures from first principle, the centroid of composite and built-up sections. Moment of inertia: Introduction, method of determining the second moment of area of plane sections from first principles, parallel axis theorem and perpendicular axis theorem section modulus, the radius of gyration, moment of inertia of composite area and built-up sections, concept of product of inertia.

Unit 5: Analysis of trusses (06 hours)

Types of trusses, analysis of statically determinate trusses using the method of joints and method of sections.

Unit 6 : Dynamics (08 hours)

Kinematics: Displacement, average velocity, instantaneous velocity, speed, acceleration, average acceleration, variable acceleration, acceleration due to gravity, Newton's law of motion, rectilinear motion and numerical problems, curvilinear motion, super elevation, projectile motion, relative motion, numerical problems, motion under gravity, numerical problems Kinetics: D 'Alembert's principle and its application in-plane motion and connected bodies including pulleys

References:

1. Elements of Civil Engineering (IV Edition) by S.S. Bhavikatti, New Age International Publisher, New Delhi, 3rd edition 2009.
2. Engineering Mechanics by S.Timoshenko,D.H.Young, and J.V.Rao, TATA McGraw-Hill Book Company, New Delhi
3. Beer FP and Johnson ER, "Mechanics for Engineers- Dynamics and Statics"- 3rd SI Metric edition, Tata McGraw Hill. – 2008
4. Shames IH, "Engineering Mechanics – Statics & Dynamics"- PHI – 2009

List of Experiments:

1. Graphical solutions to problems in mechanics
    a) System of forces- concurrent and non- concurrent
    b) Wedge and block friction
    c) Analysis of trusses
2. Study of any four lifting machines

Course Outcomes:

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

CO1. Know basics of Civil Engineering, its scope of study, knowledge about various fields.

CO2. Comprehend the action of Forces, Moments, and other loads on systems of rigid bodies.

CO3. Compute the reactive forces and the effects that develop because of the external loads.

CO4. Locate the Centroid and compute the Moment of Inertia of regular cross sections.

CO5. Express the relationship between the motions of bodies and equipped to pursue studies in allied courses in Mechanics.

Basic Electronics

Course Code	PCC-EC-/IN/EE-102			
Category	Program Core Course			
Course Title	Basic Electronics			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	3	0	2	4

Course Objectives:

1. To introduce some of the basic electronic components and circuits.
2. To study the characteristics and working of BJT.
3. To explain the applications of components and devices.
4. To understand the concept of transistor biasing and its applications.
5. To know oscillators and operational amplifiers.

Course Content:

Unit 1: Introduction to Semiconductors(07 hours)

P-N junction diode, Diode resistance, equivalent circuits, diode rectifiers, Half-wave & all parameters, Full-wave & all parameters, Bridge type & all parameters, Filter circuits, clipper circuits, Clamper circuits, Zener diode, Block diagram of dc regulated power supply, Three terminal IC regulators (78XX series), Light-emitting diode, Photo diode, Tunnel diode.

Unit 2: BJT fundamentals(08 hours)

Common Base (CB), configurations with their characteristics, Common Emitter (CE), configurations with their characteristics, Common Collector (CC), configurations with their characteristics, Comparison of CB, CE, CC configurations, transistor as a switch, Transistor as a switch, transistor as an amplifier, Field effect transistors: Working principle, characteristics of JFET, Field effect transistors: Working principle, characteristics of MOSFET, Comparison of BJT, JFET and MOSFET.

Unit 3: Load line analysis (04 hours)

Operating point, biasing, Base resistor biasing, Biasing with feedback resistor, Voltage divider bias method.

Unit 4: Transistor Amplifiers(07 hours)

Single stage CE amplifier, phase reversal, Dc and ac equivalent circuits, Load-line analysis, input and output impedance of an amplifier, Gain concept of an amplifier, Amplifier equivalent circuit. Multistage RC coupled amplifier.

Unit 5: Oscillators (07 hours)

Principles and advantages of negative feedback, voltage and current feedback, Darlington amplifier, positive feedback, Barkhausen's criteria, various sinusoidal oscillator.

Unit 6: Operational Amplifiers(07 hours)

Op-Amp as a black box, ideal Op-Amp, Characteristics of INV and non-INV, summing and difference amplifier, Unity gain buffer, Op-Amp as a comparator.

References:

1. R. L. Boylestad & Louis Nashlesky (2007), Electronic Devices &Circuit Theory, Pearson Education
2. V. K. Mehta, Principles of Electronics, S. Chand Publication
3. R. S. Sedha (2010), A Text Book of Electronic Devices and Circuits, S. Chand & Co.

List of Experiments:

1. Identification of R, L, C Components (Colour Codes)
2. Study and operation of
    a) Multimeters (Analog and Digital)
    b) Function Generator
    c) Regulated Power Supplies
    d) Study and Operation of CRO
3. PN Junction diode characteristics A. Forward bias B. Reverse bias
4. V-I characteristics of Zener diode
5. Transistor CB characteristics (Input and Output)
6. Transistor CE characteristics (Input and Output).
7. Half wave Rectifier
8. Full wave Rectifier
9. FET characteristics
10. UJT Characteristics
11. CE Amplifier
12. CC Amplifier
13. Base resistor biasing
14. Biasing with feedback resistor
15. Voltage divider bias method

Above list is only representative.

Course Outcomes:

At the end of Course Students will be able-

CO1. To identify the electronics components, its values, number, and other specifications.
CO2. To interpret various characteristics of electronic components and devices.
CO3. To compare various configurations and biasing technique of BJT.
CO4. To demonstrate special purpose devices.
CO5. To design op-amp circuits for various applications.

Computer Fundamentals

Course Code	PCC-IT/CS-102			
Category	Programme Core Course			
Course Title	Computer Fundamentals			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	3	0	2	4

Course Objectives:

1. Understand the Basics of Computers and Computing: Fundamental components of computers and their role in modern society. Acquire knowledge of the CPU, memory, input/output devices, and the organization of computer systems.
2. Familiarize with Operating Systems, Computer Networks and Software: Learn about different operating systems and the essential software used in computer systems. Understand the concepts of computer networks, the importance of networking, and the fundamentals of the Internet.
3. Introduction to Programming Concepts and Web Development: Get introduced to programming principles and basic programming constructs. Learn the basics of HTML, CSS, and JavaScript for building web pages and forms.
4. Explore Content Management Systems (CMS): Understand the purpose and functionality of CMS, and learn to set up and manage a website using WordPress.
5. Introduction to Databases and Cloud Computing: Acquire knowledge of database management systems, CRUD operations, and an overview of cloud computing.

Course Content:

Unit 1: Introduction to Computer Fundamentals (6 hours)

1. Overview of Computers and Computing
2. Computer Components and Peripherals
3. Operating Systems and Software
4. Computer Networks and the Internet
5. Introduction to Programming Concepts

Unit 2: Computer Hardware and Architecture (7 hours)

1. CPU, Memory and Input/Output Devices
2. Computer Organization and Architecture and different types of Gates.
3. Memory types.

Unit 3: Data Communication and Computer Network (8 hours)

1. Introduction; Importance of Networking;
2. Data Transmission Media;
3. Computer Network; Network Types
4. Network Topology
5. Communication Protocol
6. Network Devices;

Unit 4: Introduction to world wide web (WWW) (8 hours)

1. World Wide Web and Internet Fundamentals
2. HTML (Hypertext Markup Language) Basics and tags

3. CSS (Cascading Style Sheets) Fundamentals and layput
4. Introduction to JavaScript and Client-Side Scripting for form validation.

Unit 5: Introduction to Content management system (8 hours)

1. Overview of Content Management Systems (CMS)
2. Installing and Setting Up WordPress Themes and Plugins
3. Creating and Managing CMS Content and user.
4. Design CMS site using google.
5. Web Hosting Services and Providers

Unit 6: Fundamentals of Database, clouds & Forms (8 hours)

1. Introduction; Database.
2. Database Management System;
3. Database Types
4. CRUD operation in Mysql using phpMyAdmin.
5. Connect to databases using any technology.
6. Study and compare different clouds.

References:

1. "Computer Science: An Overview" by J. Glenn Brookshear"
2. Computer Organization and Design" by David A. Patterson and John L. Hennessy
3. "Computer Architecture: A Quantitative Approach" by John L. Hennessy and David A. Patterson
4. "HTML and CSS: Design and Build Websites" by Jon Duckett
5. "JavaScript: The Good Parts" by Douglas Crockford
6. "Responsive Web Design" by Ethan Marcotte
7. "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics" by Jennifer Niederst Robbins
8. "WordPress All-in-One For Dummies" by Lisa Sabin-Wilson
9. "Professional WordPress: Design and Development" by Brad Williams, David Damstra, and Hal Stern
10. "The Web Hosting Manager" by Nick Vale
11. "Domain Names: How to Choose and Protect a Great Name for Your Website" by Michael Bluejay.
12. "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws" by Dafydd Stuttard and Marcus Pinto
13. "High Performance Web Sites: Essential Knowledge for Front-End Engineers" by Steve Souders
14. Introduction to Database Systems https://nptel.ac.in/courses/106106220 - Introduction to Database Systems
15. Data Communication https://nptel.ac.in/courses/106105082 -
16. Computer Organization https://nptel.ac.in/courses/106106092 -

List of Experiments:

1. Explore Operating Systems: Install different operating systems (e.g., Windows, Linux) on virtual machines and understand their basic features and functionalities. O
2. Open any machine and study all hardware parts.
3. Study Network in your department and college.
4. Programming Basics: Write a simple program in a programming language of choice to perform arithmetic operations or display patterns.

5. CPU Performance Analysis: Measure and compare the execution time of simple algorithms on different CPUs or processor architectures.
6. Design web portal on google sites.
7. Basic HTML and CSS: Create a static web page using HTML for content structure and CSS for styling. Deploy on any cloud like pythonanywhere/AWS/Azure/GCP.
8. JavaScript Interaction: Write a JavaScript program to validate user input on a web form and provide real-time feedback.
9. Responsive Web Design: Modify an existing web page to be responsive and adjust its layout based on different screen sizes.
10. Image Optimization: Optimize images on a web page for faster loading times without compromising quality.
11. WordPress Theme Customization: Customize an existing WordPress theme by changing colors, fonts, and layout.
12. Plugin Integration: Install and configure a plugin to add new functionality (e.g., contact form, social media sharing) to a WordPress website

Course Outcomes:

CO1. Understanding of computer fundamentals and function of computer hardware and architecture: Students will understand the role of the central processing unit (CPU), memory, and input/output devices in computer systems and comprehend different types of gates used in digital circuits.

CO2. Understand the basics of operating systems, computer networks and internet concepts: Students will be familiar with different operating systems and software used in computer systems and their functions. Be able to describe the principles of computer networks, their types, and various network topologies, and understand the significance of communication protocols.

CO3. Gain introductory programming knowledge and manage basic web pages : A basic understanding of programming. Able to build and style web pages using HTML and CSS.

CO4. Install, configure, and manage content management systems (CMS): customize a website using WordPress, including installing themes and plugins, managing content.

CO5. Gain an understanding of databases and cloud computing: Able to store and retrieve data, perform basic CRUD operations using phpMyAdmin and MySQL, and get an overview of cloud computing concepts.

Elements of Mechanical and Production Engineering

Course Code	PCC-ME/PE-102			
Category	Program Core Course			
Course Title	Elements of Mechanical & Production Engineering			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	3	0	2	4

Course Objectives:

1. To impart knowledge of thermodynamics concepts & their significance
2. To provide knowledge about various power transmission devices & various sources of energy
3. To Make the students understand the basic design procedure of engineering components
4. To impart knowledge of basic concepts on manufacturing principles and machine tools and their advancement.
5. To understand various terminologies of production systems and industrial management
6. To create interest among students of all engineering disciplines about Mechanical & Production Engineering Systems

Course Content:

Unit I: Thermodynamic Concepts (11 hours)

Introduction to thermodynamics, introduction to various thermodynamic properties, Heat and Work, thermodynamic laws and their significance.

Power plant engineering and Sources of Energy: Conventional- thermal, nuclear, hydraulic power plant. Nonconventional- wind, solar, tidal, geothermal.

Unit II: Introduction to Design Fundamentals and materials (8 hours)

Design considerations, steps in design, various mechanical properties of material

Unit III: Introduction to transmission devices (8 hours)

Shafts, belt drive, chain drive, gear and gear trains, clutches.

Unit IV: Fundamentals of Machine Tool and Operation (8 hours)

Introduction to various manufacturing processes, Construction and Working Principle of Lathe, Various Lathe Operations: Turning, Facing, Taper Turning and Knurling. Construction and Working of Milling Machines and applications. Construction and working of simple Drilling Machines and applications. (Sketches of layout need not be dealt with for all machine tools).

Unit V: Introduction To Production System (10 hours)

Concept of production, Types of production system with their advantages and disadvantages, Plant Layout.

Basic of Industrial Management: Management Definition, Administration Definition, Proprietorship Partnership, Cooperative Society-Advantages and disadvantages, Planning Definition, Leadership Types, Quality of good leader.

References:

1. Y. Cengel & M. Boles “Thermodynamics an Engineering approach” Tata McGraw Hill education 2008
2. R. K. Rajput “Thermal Engineering” Laxmi Publications 2010
3. P. K. Nag “Engineering Thermodynamics” Tata McGraw Hill education 2008
4. V. B. Bhandari “Design of Machine Elements” Tata McGraw-Hill education 2010
5. M. Mahajan, “Industrial Engineering and Production Management”, Dhanpat Rai & Co.
6. S. K. & A.K. Hajra Choudhary “Elements of workshop technology vol I & vol II” Media promoters & Publishers Pvt ltd 2007

List of Experiments:

1. Study and Demonstration of anyone Thermodynamic application device.
2. Study the Conventional or Renewable Energy sources (Solar Lab).
3. Demonstration of the machine consists of Gear Trains.
4. Demonstration of various elementary mechanisms and their motion.
5. Demonstration of step turning of a Mild Steel cylindrical job using center lathe.
6. Demonstration of developing one model involving Lathe, Milling and Drilling.
7. Study and Demonstration of CNC machine techniques.

Course Outcomes:

Students will be able to,

CO1. Discuss various thermodynamic properties of mechanical systems
CO2. Explain use and functioning of various energy conversion devices.
CO3. Discuss requirement of various mechanical properties for various materials.
CO4. Identify and recommend motion transmission devices for various applications.
CO5. Illustrate basic concepts of Industrial Management in the fields of different organizations and society and its utilization
CO6. Determine the application of machining techniques leading to the latest advancements and transmission systems in day-today activities.

Web and Video link(s):

1. https://www.youtube.com/watch?v=Zgp86PVXXuQ (Energy resources)
2. https://nptel.ac.in/courses/112103275 (Thermodynamic Concepts)
3. https://nptel.ac.in/courses/116/102/116102012/ (Introduction to transmission devices)
4. https://nptel.ac.in/courses/112/105/112105233/ (Machine Tool and Operation)
5. https://nptel.ac.in/courses/110107150 (Introduction To Production System)

Basics of Textile and Garment Manufacturing

Course Code	PCC-TT-102			
Category	Program Core Course			
Course Title	Basics of textile and garment manufacturing			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	3	0	2	4

Course Objectives:

1. To learn basics of fibre, yarn, fabric and garment.
2. To understand and perform practical's of outline of fibre, yarn, fabric and garment manufacturing.
3. To enable the students to analyze and gain knowledge of different textile products.
4. To provide the knowledge of textile industry and machine manufacturing.

Course Content:

Unit 1: Introduction of fibre to fabric (6 hours)
Classification of Fibres, introduction to Ginning, brief outline of spinning process, Outline of weaving process, classification of looms, passage of warp through a weaving machine, brief outline of melt spinning and texturizing.

Unit 2: Testing and analysis (6 hours)
Introduction to fibre, yarn and fabric testing, Yarn numbering systems, GSM (gram/ sq. mt.), EPI (ends/ inch), and PPI (picks/ inch), Repeat of a fabric design, draft, basic weaves.

Unit 3: Fabrics manufacturing & processing (6 hours)
Different Methods of fabric manufacturing (weaving, knitting, nonwovens, braiding etc.), Outline & brief description about different steps involved in Textile Wet Processing.

Unit 4: Introduction to knitting & nonwovens (6 hours)
Outline of non-woven manufacturing, what is technical textiles and its applications, Brief about Warp and Weft Knitting, knitted products.

Unit 5: Garment manufacturing (5 hours)
Garment business overview in India, Organizational structure of a garment company, Outline of garment manufacturing process, definition and types of merchandizing.

Unit 6: Textile industry & machine manufacturing (6 hours)
Organization of the Indian Textile industry, Role and functions of textile ministry, about textile machine manufacturing industry.

Unit 7: Other yarn spinning processes (6 hours)
Introduction to Silk Spinning, Worsted Spinning, Jute Spinning, Linen Spinning and their applications.

References:

1. https://archive.nptel.ac.in/course.html
2. https://nios.ac.in/media/documents/vocational/Handloom_weaving/Handloom_weaving_course_Eng/Fibre_to_Fabric_eng.pdf
3. Manual of Textile Technology Volume 1, Technology of Short-Staple Spinning, Werner Klein, The Textile Institute.
4. Yarn preparation for handloom weaving. B K Behera, NHDCL, Ministry of Textiles.

5. Principles of Textile Testing, J. E. Booth, Newnes-Butterworths, London
6. Textile Science, An explanation of fibre properties, EPG Ghol & LD Vilensky
7. Technology of clothing & Manufacturing, Carr & Lathams, revised by David. J. Taylor.
8. Textile Preparation & Dyeing, Roy, Choudhury A.K.; Published, Oxford & IBH Publishing Co. Pvt. Ltd.

List of Experiments:

1. Study of outline of spinning, weaving and processing.
2. Identification of different textile fibres by their appearance and burning behaviour.
3. Study of cotton cultivation and Ginning.
4. Study of different stages involved in yarn manufacturing.
5. Study of different stages involved in fabric manufacturing.
6. Study of passage of warp through a plain loom.
7. Study of Fineness of a yarn and GSM of a fabric
8. Brief introduction to fibre, yarn and fabric testing.
9. Passage of yarn through hand knitting and circular knitting machine
10. Study of Sizing and Desizing of a fabric.
11. Study of Scouring and Bleaching of a fabric.
12. Study of dyeing and printing of a fabric
13. Study of different stages involved in garment manufacturing. Ex Shirt.

Course Outcomes:

At the end of this course:

CO1. Students will learn and understand the basics of textiles and apparels.

CO2. Students will also learn and understand the manufacturing methods of textiles and apparel.

CO3. This course will make the students competent to analyze and identify the textiles and garments.

CO4. This course will enable students to learn practical knowledge of production methods.

CO5. This course at the highest level may also provide the knowledge of textile and garment industry and their machines.

Introduction to Indian Knowledge System

Course Code	IKS-102			
Category	Humanities, Social Science and Management			
Course Title	Introduction to Indian Knowledge System			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	2	0	0	2

Course Objectives:

The main objectives of this course are as follows:

1. Creating awareness amongst the youths about the true history and rich culture of the country.
2. Understanding the scientific value of the traditional knowledge of Bhārata;
3. Promoting the youths to do research in the various fields of Bhāratīya knowledge system.
4. Converting the Bhāratīya wisdom into the applied aspect of the modern scientific paradigm.
5. Adding career, professional and business opportunities to the youths.
6. It is also believed that after completion of this course the students will get a holistic insight into the understanding the working of nature and life.

Course Content:

UNIT I: Bhāratīya Civilization and Development of Knowledge System(4 hours)

Genesis of the land, Antiquity of civilization, On the Trail of the Lost River, Discovery of the SaraswatīRiver, the Saraswatī-Sindhu Civilization, Traditional Knowledge System, The Vedas, Main Schools ofPhilosophy (6+3), Ancient Education System, the Takṣaśilā University, the Nālandā University,Alumni, Knowledge Export from Bhārata.

UNIT 2: Arts, Literature, and Scholars(4 hours)

Art, Music, and Dance, Naṭarāja– A Masterpiece of Bhāratīya Art, Literature, Life and works ofAgastya, Lopāmudrā, Ghoṣā, Vālmīki, Patañjali, Vedavyāsa, Yājňavalkya, Gārgī, Maitreyī,Bodhāyana, Caraka, Suśruta, Jīvaka, Nāgārjuna, Kaṇāda, Patañjali, Kauṭīlya, Pāṇini, Thiruvalluvar,Āryabhaṭa, Varāhamihira, Ādi Śaṅkarācārya, Bhāskarācārya, Mādhavācārya.

UNIT 3: Science, Astronomy, and Mathematics(4 hours)

Concept of Matter, Life and Universe, Gravity, Sage Agastya's Model of Battery, Velocity of Light,Vimāna: Aeronautics, Vedic Cosmology and Modern Concepts, Bhāratīya Kāla-gaṇanā, Kerala Schoolfor Mathematics and Astronomy, History and Culture of Astronomy, Sun, Earth, Moon, and Eclipses,Earth is Spherical and Rotation of Earth, Archaeostronomy; Concepts of Zero and Pi, Number System,Pythagoras Theorem, and Vedic Mathematics.

UNIT 4: Engineering, Technology, and Architecture(4 hours)

Pre-Harappan and Sindhu Valley Civilization, Laboratory and Apparatus, Juices, Dyes, Paints and Cements, Glass and Pottery, Metallurgy, Engineering Science and Technology

in the Vedic Age and Post-Vedic Records, Iron Pillar of Delhi, Rakhigarhi, Mehrgarh, Sindhu Valley Civilization, Marine Technology, and Bet–Dwārkā.

UNIT 5: Life, Environment, and Health(4 hours)

Ethnic Studies, Life Science in Plants, Anatomy, Physiology, Agriculture, Ecology and Environment,Āyurveda, Integrated Approach to Healthcare, Medicine, Microbiology, Medicine, Surgery, and Yoga,etc.

References:

1. Textbook on The Knowledge System of Bhārata by Bhag Chand Chauhan,
2. Histrory of Science in India Volume-1, Part-I, Part-II, Volume VIII, by Sibaji Raha, et al. National Academy of Sciences, India and The Ramkrishan Mission Institute of Culture, Kolkata(2014).
3. Pride of India- A Glimpse of India's Scientific Heritage edited by Pradeep Kohle et al.Samskrit Bharati (2006).
4. Vedic Physics by Keshav Dev Verma, Motilal Banarsidass Publishers (2012).
5. India's Glorious Scientific Tradition by Suresh Soni, Ocean Books Pvt. Ltd. (2010).

Course Outcomes:

After completion of course, students will be able to,

1. Understand and appreciate the importance of ancient knowledge to a society.
2. Familiarise with the key components of the IKS
3. Develop some appreciation of IKS historicity
4. Have a indelible imprint of IKS on mind and soul.
5. Feel the contributions made by ancient Indians in the field of Science, Philosophy and related applications and concepts

Photography

Course Code	CC-102 (A)			
Category	Liberal Learning Course			
Course Title	Photography			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	1	0	2	2

Course Objectives:

1. Understand the basic principles of photography, including composition, lighting, and exposure.
2. Develop technical skills in using a camera (DSLR /mirror less or smartphone) and post-processing images.
3. Cultivate a creative and critical eye for photography and visual storytelling.
4. Explore different genres of photography, such as portrait, fashion, product, interior & architecture, sports, travel, nature & wildlife.

Course Content:

Unit 1: Introduction to Photography (01 hours)

History and evolution of photography
Types of cameras and their components
Understanding camera settings (aperture, shutter speed, ISO)

Unit 2 : Composition and Framing (02 hours)

Rule of thirds and other compositional techniques
Using lines, shapes, and patterns in photography
Exploring different angles and perspectives

Unit 3: Lighting Techniques (02 hours)

Natural light vs. artificial light
Techniques for using natural light effectively
Introduction to off-camera flash and artificial lighting
Product lighting

Unit 4 : Portraiture Photography (02 hours)

Posing and directing subjects
Portrait lighting setups
Environmental portraits vs. studio portraits

Unit 5: Fashion & Modelling photography (02 hours)

Indoor & outdoor fashion portfolio shoots
Modelling shoots (Male & Female portfolios)

Unit 6: Wildlife and Nature Photography (02 hours)

Capturing landscapes and natural scenes
Flowers, macro photography
Wildlife, birds

Unit 7: Food & product photography (02 hours)

Aesthetic arrangement of foods & products

Creating a related ambiance & lighting

Unit 8: Image editing & post production (02 hours)

Basic introduction to Adobe Photoshop

Image editing tools & techniques & designing a small poster

Participation and engagement in class activities

Completion of photography assignments and projects

Portfolio review and presentation

References:

1. Better Photo Basics: The friendliest book on photography for beginners ; Author: Jim Miotke ISBN-10: 081740502X
2. Tony Northrup's DSLR Book: How to Create Stunning Digital Photography; Publisher: Mason Press Author: Tony Northrup: ISBN-10: 0988263408
3. The Digital Photography Book: Part 1,2 & 3, Publisher: Peachpit Press, Author: Scott Kelby ISBN-10: 0321934946
4. One Face, Fifty Ways, a bible to portrait photography, Author: Mark Wilkinson & Imogen Dyer Publisher: Ilex ISBN-10: 1781574308
5. The Art of Photography; Publisher: Rocky Nook; Author: Bruce Barnbaum , ISBN-10: 1681982102
6. Photography Rules; Author: Paul Lowe; Publisher: Frances Lincoln; ISBN-13: 978-0711242586
7. Extraordinary Everyday Photography; Publisher: Amphoto; Author: Brenda Tharp, Jed Manwaring, ISBN-10: 081743593X
8. Mastering Portrait Photography; Publisher: Ammonite Press; Author: Paul Wilkinson and Sarah Plater, ISBN-10: 1781450854
9. The Landscape Photography Workshop; Publisher: Pepin Press; Author: Ross Hoddinott and Mark Bauer, ISBN-10: 1907708979
10. Mastering Aperture, Shutter Speed, ISO & Exposure; Publisher: CreateSpace Author: Al Judge, ISBN-10: 1482314452.
11. How to Photograph Food; Publisher: Ilex Press; Author: Beata Lubas, ISBN-10: 1781576912
12. LiThe Wildlife Photography Workshop; Author: Hoddinott, Ross; Publisher: Ammonite Press, ISBN-10 : 190770857X
13. Wildlife Photography: Proven Techniques for Capturing Stunning Digital Images Ballard, Jack (Author) Falcon Guides (Publisher)
14. Wildlife Photography: From Snapshots to Great Shots; Amazon Kindle Edition Excell, Laurie S. (Author); Peachpit Press (Publisher)
15. Wildlife Photography: An expert guide; Bernabe, Richard (Author); Ilex Press (Publisher)
16. https://www.adorama.com/alc/10-best-free-online-photography-courses/
17. https://visualeducation.com/free-photography-course/
18. https://alison.com/course/introduction-to-digital-photography
19. https://www.iphotography.com/free-photography-course/
20. https://www.lifewire.com/best-free-online-photography-classes

List of Experiment:

1. Understanding different parts & functions of two types of digital Cameras DSLR & MIRRORLESS
2. Different types of Lenses & their applications
3. Types of lights , modifiers & their uses in studio and outdoor
4. Different types of lighting Split Lighting Rembrandt Lighting Butterfly Lighting Broad Lighting Short Lighting Back Lighting
5. Couple, Family, and Group Portraits. Fine Art Portraits. Corporates portraits
6. Environmental Portraits & Candid and Street Portraits.
7. Indore Fashion Photography. Glamour photography, Model portfolio shoot
8. Lighting for food & product photography, food styling, use of props, use of natural light. Capturing splash & pour
9. Kit for wildlife photography, super zoom lens and use in wildlife Avian photography, camera setting & lenses for landscapes
10. Introduction to Image editing. Basic intro to Adobe Photoshop
11. Basic & advanced image editing techniques
12. designing of a product catalogue & model portfolio

Course Outcomes:

Students will be able to,

CO1. Learn about different types of modern cameras and their components , rule of frame composition and angles
CO2. Learn use of natural and artificial lighting
CO3. Portraiture Photography, Fashion and Modelling photography
CO4. Learn about photographic aspects, also learn about beauty of nature and animal behaviour.
CO5. Learn about image editing aspects in software

Dramatics

Course Code	CC-102(B)			
Category	Liberal Learning Course			
Course Title	Dramatics			
Scheme and Credits	**L**	**T**	**P**	**No. of credits**
	1	0	2	2

Course Objectives:

1. **Developing Performance Skills:** To enhance the students' acting abilities, voice modulation, body language, and facial expressions, enabling them to effectively portray characters on stage.
2. **Understanding Theatrical Elements:** To familiarize students with the essential elements of theatre, such as plot development, dialogue, setting, costume, lighting, and sound, and how these elements contribute to the overall production.
3. **Strengthening Creativity and Imagination:** To encourage students to think creatively, generate original ideas, and explore imaginative approaches to storytelling and character development.
4. **Improving Communication Skills:** To help students become more confident and effective communicators, both on and off the stage, by practicing clear articulation, active listening, and engaging delivery.
5. **Cultivating Teamwork and Collaboration:** To promote teamwork and collaboration among students, as theatre productions require coordination and cooperation among actors, directors, stage managers, and technical crew.
6. **Exploring Different Theatrical Styles:** To expose students to various theatrical styles and genres, such as comedy, tragedy, farce, realism, and experimental theater, broadening their understanding of the art form.
7. **Analysing Dramatic Works:** To develop the students' critical thinking skills by analyzing and interpreting scripts, understanding character motivations, and identifying underlying themes and messages in dramatic works.
8. **Building Confidence and Self-Expression:** To boost students' self-confidence, self-awareness, and self-expression, allowing them to express emotions and ideas freely in a safe and supportive environment.
9. **Appreciating Cultural Diversity:** To promote an appreciation for the diverse cultural expressions found in theatrical performances worldwide and to explore the historical and social context of different theatrical traditions.
10. **Preparing for Performances:** For courses culminating in public performances, the objective may include preparing students to deliver polished and engaging performances in front of an audience.

Course Content:

Unit 1: Introduction of Theatre (01 hours)

Origin and Growth of Theatre, Definition of Theatre, Aims and Objectives of Theatre

Unit 2: Introduction of Drama (01 hours)

Definition of Drama, Aims and Objectives of Drama, Elements of Drama – Script, Direction, Acting, Set, Light, Make-up, Costume, Music, Dance.

Unit 3: Drama Script Writing (02 hours)

Introduction of Script Writing, Types of Drama, Contents of Drama writing (Language, Theme, Plot, Characterization, Climax).

Unit 4: Direction (02 hours)

Origin of Direction, Principles of Direction, Duties of Director, Type of Directors

Unit 5: Acting (04 Hours)

Origin and Introduction of Acting, Definition of Acting, Different types of Acting, Bharatmuni (Angik Abhinay, Vachik Abhinay, Satvik Abhinay, Aaharya Abhinay), Stanislavski's Method of Acting, Bertolt Brecht's Method of Acting, Introduction of Camera Acting (Cinema, Tv-Serial)

Unit 6: Set Design (01 hours)

Principles of Designs, Elements & Designing, Scenic Designing.

Unit 7: Light Design (01 hours)

Importance of Light Design, Principal of Light Design, Light Equipments, Light Handling, Light Designing.

Unit 8: Costume Design (01 hours)

Principal of Costume Design, Elements & Designing, Various Types of Costume Designing.

Unit 9: Make-up (01 hours)

Types of Makeup, Objectives of Makeup, Material of Makeup, Usage of makeup equipments

Unit 10: Background Music (01 hours)

Importance of Background Music, Equipment of Background Music, Quesheet of Background Music

References:

1. Narhar Kurundkar, "Rangashala"
2. H.V. Sharama, "Special Aspects of Natya Sastra"
3. Yashwant Kelkar, "Natynirmiti"
4. K Narayan Kale, "Natyavimarsh"
5. Konstantin Stanislavski, "An Actor Prepares"
6. Dinesh Khanna, "Abhinay Chintan"
7. Shriram Lagu, "Laman"
8. Dr.Shripad Joshi, "Sanwad Shastra"
9. Godavari Ketkar, "Bharatmuni's Natyashatra"
10. Dr.Sanjay Patil Devlankar, "Abhinay Shatra Parichay"
11. Dr.Jayant Shevtekar, "Natyaprayog Vindnyan"
12. Dr.Sampada Kulkarni, "Natyashatrachi Olakh"

List of Experiments:

1. Self-Introduction and Performance
2. Script Writing (Theme, Plot, Characterization, Language, climax).
3. To Develop Skills of Dialogue Writing.
4. To Understand Various Elements of Direction
5. To Develop Basic Direction Skills.
6. Angik Abhinay (Gestures, Postures, Stage Movement)
7. Angik Abhinay (To understand rhythm of body)
8. Wachik Abhinay (Voice and Speech)
9. Wachik Abhinay (Modulation and Diction)
10. Satvik Abhinay (To Understand Character and Rassanirmiti)
11. To Learn Different Styles of Acting (Stanislavski, Bertolt Brecht's)
12. Set geography and Scenic Design
13. To Learn Usage of Light Equipment and Colour Theory of Light Design.
14. To Learn Music Operating System, Live background Music, Recorded Background Music
15. To Learn Usage of Make-up Equipment, Usage of Costumes and Colour Theory

Course Outcomes:

After completing this course student will be able to

CO1. Understand few basic concepts of Dramatics and Theatre Arts.
CO2. To Enhance Personality by bringing changes in habits.
CO3. To Understand and feel the interconnections between mind, body and soul.
CO4. To increase teamwork attitude and leadership quality.
CO5. To develop social sensitivity.

Exit Plan:

If a student wishes to discontinue the programme after one year, he/she has to complete the following skill-based courses of 8 credits or 12-week internship. The department-wise scheme is given in the following table:

S. N.	Programme Name	Course Name	Credits
1	Chemical Engineering	1. Unit operations and process 2. Water Technology	04 04
2	Civil Engineering	1. Surveying & Modern Equipment's	04
3	Computer Science and Engineering, Information Technology	1. Basic Certificate course on typing and MS office (Word, Excel and PowerPoint presentation) 2. Basics of Social Media Marketing (Face-book, Google, LinkedIn and many more 3. Prompt engineering **(Any two)**	04 04
4	Electrical Engineering	1. Electrical Design and maintenance 2. Electrical Automation	04 04
5	Electronics and Telecommunication Engineering	1. Consumer Electronic/Radio Engineering /Digital Electronics (Any one course) 2. Electronics Servicing and Maintenance	04 04
6	Instrumentation Engineering	1. Electrical, Electronics and Biomedical In-struments: Repairing and Testing. 2. Fundamentals of Instrumentation	04 04
7	Mechanical Engineering	1. KLiC Certificate in AutoCAD (Course avail-able on Maharashtra Knowledge Corpo-ration Limited) 2. KLiC Office Assistance (Course available on Maharashtra Knowledge Corporation Limited)	04 04
8	Production Engineering	1. 3D Modelling Software 2. 2D Modelling Software	04 04
9	Textile Technology	1. Yarn Manufacturing Technology 2. Fabric Forming Technology	04 04