

Zeal Education Society's

## **ZEAL COLLEGE OF ENGINEERING & RESEARCH, PUNE – 41**

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

*NAAC Accredited with A+ Grade / ISO 21001:2018*



### **DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

#### **Curriculum Structure and Syllabus of**

#### **F.Y. B. Tech. – Electronics and Computer Engineering**

**(With effect from - Academic Year 2025 - 26)**

### **VISION OF THE INSTITUTE**

To be a premier institute in technical education by imparting academic excellence, research, social and entrepreneurial attitude.

### **MISSION OF THE INSTITUTE**

- To achieve academic excellence through innovative teaching and learning process.
  - To imbibe the research culture for addressing industry and societal needs.
  - To inculcate social attitude through community engagement initiatives.
  - To provide conducive environment for building the entrepreneurial skills.



## DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

### VISION:

To be acknowledged as a premier center of excellence in Electronics and Computer Engineering, renowned for advanced teaching practices research initiatives and nurturing socially responsible and entrepreneurial engineers.

### MISSION:

- M1:** To promote value-added education by nurturing an environment of academic excellence through innovative teaching-learning processes.
- M2:** To inculcate research approach through innovation and skill development centers.
- M3:** To nurture a profound sense of social responsibility and entrepreneurial compassion among our students.

### PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

- PEO1:** Graduates will apply their knowledge of mathematics, science, and Electronics and Computer Engineering principles to identify, formulate, and solve complex engineering problems.
- PEO2:** Graduates will apply technical expertise, leadership, and entrepreneurship, to establish ethical organizations to address societal needs and pursue higher studies.
- PEO3:** Graduates will have successful careers in Electronics and Computer Engineering or related fields, demonstrating technical competence, leadership, and ethical responsibility.

### PROGRAM OUTCOMES (POs):

- PO1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2: Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3: Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO4: Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.



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- PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- PO6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9: Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO12: Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### PROGRAM SPECIFIC OUTCOMES (PSOs):

**PSO1:** Ability to design and analyze electronic circuits and systems, including analog and digital systems, embedded systems, and integrated circuits.

**PSO2:** Proficiency in understanding, designing, and evaluating computer hardware and software systems, including microprocessors, computer networks, and distributed computing systems.



## DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

### LIST OF ABBREVIATIONS

Abbreviation	Description
BSC	Basic Science Course
ESC	Engineering Science Course
PCC	Programme Core Course
PEC	Programme Elective Course
MDM	Multidisciplinary Minor
OE	Open Elective - Other than a particular program
VSEC	Vocational and Skill Enhancement Course
AEC	Ability Enhancement Course
ENTR	Entrepreneurship
EC	Economics
MC	Management Courses
IKS	Indian Knowledge System
VEC	Value Education Courses
RM	Research Methodology
CEP	Community Engagement Project
FP	Field Project
PROJ	Project
INT	Internship
OJT	On Job Training
CC	Co-curricular Courses
HSSM	Humanities Social Science and Management
ELC	Experiential Learning Course
B. Tech	Bachelor of Technology
L	Lecture
P	Practical
T	Tutorial
H	Hours
CR	Credits
CIE	Continuous Internal Evaluation
ETE	End Term Evaluation
TH	Theory
Tut	Tutorial
TW	Term Work
OR	Oral
PR	Practical



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**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

**First Year B. Tech. - Electronics and Computer Engineering: Semester - I**

Course Code	Course Type	Course Name	Teaching Scheme (hrs/Week)							Evaluation Scheme (Marks)					
			L	P	T	H	CR			CIE	ETE	TW	PR	OR	
TH	PR/Tut	Total	CIE	ETE	TW	PR	OR	Total							
<a href="#">25ECBS101</a>	BSC	Engineering Mathematics - I	3	-	-	3	3	-	3	40	60	-	-	-	100
<a href="#">25ECBS102</a>	BSC	Engineering Physics	2	2	-	4	2	1	3	40	60	25	-	-	125
<a href="#">25ECES101</a>	ESC	Basic Electronics Engineering	3	2	-	5	3	1	4	40	60	50	-	-	150
<a href="#">25ECES102</a>	ESC	Electronics Circuit Design	2	2	-	4	2	1	3	40	60	50	-	25	175
<a href="#">25ECVS101</a>	VSEC	IT Proficiency	-	4	-	4	-	2	2	-	-	25	-	-	25
<a href="#">25ECCC101</a>	CC	Professional Development - I	-	4	-	4	-	2	2	-	-	50	-	-	50
25ECCC102	CC	Liberal Learning -I	-	2	-	2	-	1	1	-	-	25	-	-	25
<a href="#">25ECIK101</a>	HSSM-IKS	Indian Knowledge System & Financial Literacy	2	-	-	2	2	-	2	-	-	50	-	-	50
<b>Total</b>			<b>12</b>	<b>16</b>	<b>-</b>	<b>28</b>	<b>12</b>	<b>08</b>	<b>20</b>	<b>160</b>	<b>240</b>	<b>275</b>	<b>-</b>	<b>25</b>	<b>700</b>

\* Liberal Learning – I: Choose any one from the following:

Sr. No.	Course Code	Module	Sr. No.	Course Code	Module
1.	<a href="#">25ECCC102A</a>	Guitar	6.	<a href="#">25ECCC102F</a>	Basketball
2.	<a href="#">25ECCC102B</a>	Singing	7.	<a href="#">25ECCC102G</a>	Cricket
3.	<a href="#">25ECCC102C</a>	Cinematography	8.	<a href="#">25ECCC102H</a>	Rifle and Pistol Shooting
4.	<a href="#">25ECCC102D</a>	Dance	9.	<a href="#">25ECCC102I</a>	Volleyball
5.	<a href="#">25ECCC102E</a>	Synthesizer	10.	<a href="#">25ECCC102J</a>	Football

BoS Chairman



Director

**ZES's Zeal College of  
Engineering & Research  
Narhe, Pune - 411041.**



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**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

**First Year B. Tech. - Electronics and Computer Engineering: Semester - II**

Course Code	Course Type	Course Name	Teaching Scheme (hrs/Week)							Evaluation Scheme (Marks)					
			L	P	T	H	CR			CIE	ETE	TW	PR	OR	
							TH	PR/Tut	Total						
<a href="#">25ECBS203</a>	BSC	Engineering Mathematics - II	3	-	-	3	3	-	3	40	60	-	-	-	100
<a href="#">25ECBS204</a>	BSC	Engineering Chemistry	2	2	-	4	2	1	3	40	60	25	-	-	125
<a href="#">25ECES203</a>	ESC	Basic Electrical Engineering	3	2	-	5	3	1	4	40	60	25	-	-	125
<a href="#">25ECES204</a>	ESC	Fundamentals of Computer Systems and Networking	2	2	-	4	2	1	3	40	60	25	-	-	125
<a href="#">25ECPC201</a>	PCC	Fundamental of Operating System	2	-	-	2	2	-	2	40	60	-	-	-	100
<a href="#">25ECVS202</a>	VSEC	IoT Innovation with Arduino	-	4	-	4	-	2	2	-	-	50	-	-	50
<a href="#">25ECCC203</a>	CC	Professional Development - II	-	4	-	4	-	2	2	-	-	25	-	-	25
25ECCC204	CC	Liberal Learning-II*	-	2	-	2	-	1	1	-	-	25	-	-	25
<a href="#">25ECAE201</a>	HSSM - AEC	Quality Management System - I	-	4	-	4	-	2	2	-	-	25	-	-	25
<b>Total</b>			<b>12</b>	<b>20</b>	<b>-</b>	<b>32</b>	<b>12</b>	<b>10</b>	<b>22</b>	<b>200</b>	<b>300</b>	<b>200</b>	<b>-</b>	<b>-</b>	<b>700</b>

\* Liberal Learning – II: Choose any one from the following:

Sr. No.	Course Code	Module	Sr. No.	Course Code	Module
1.	<a href="#">25ECCC204A</a>	Guitar	6.	<a href="#">25ECCC204F</a>	Basketball
2.	<a href="#">25ECCC204B</a>	Singing	7.	<a href="#">25ECCC204G</a>	Cricket
3.	<a href="#">25ECCC204C</a>	Cinematography	8.	<a href="#">25ECCC204H</a>	Rifle and Pistol Shooting
4.	<a href="#">25ECCC204D</a>	Dance	9.	<a href="#">25ECCC204I</a>	Volleyball
5.	<a href="#">25ECCC204E</a>	Synthesizer	10.	<a href="#">25ECCC204J</a>	Football

BoS Chairman



Director  
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**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

**SYLLABUS**  
**SEMESTER - I**

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)								<b>Semester:</b> I	
<b>Course:</b> Engineering Mathematics - I								<b>Code:</b> 25ECBS101	
<b>Teaching Scheme (Hrs/week)</b>								<b>Evaluation Scheme (Marks)</b>	
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
03	-	-	03	40	60	-	-	-	100

**Prerequisites:**

Basic concept of Differentiation, Integration, Maxima and Minima, Matrices and Determinants.

**Course Objectives:**

1. To acquaint the students to rank of matrix, solution of simultaneous equations, Eigen values and Eigen vectors.
2. To acquire techniques of the expansion of functions about any point and to evaluate the indeterminate forms of limits.
3. To make students familiar with multivariable differentiation and its applications.
4. To introduce to student awareness of concept of Fourier series.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Use of matrix method for solving system of simultaneous linear equations.
<b>CO2</b>	Find Eigen values and Eigen vectors of the matrix.
<b>CO3</b>	Describe the power series expansion of a given function and evaluate limits.
<b>CO4</b>	Understand the basic concepts of partial derivatives.
<b>CO5</b>	Evaluate partial derivatives to estimate maxima and minima of function of multiple variables.
<b>CO6</b>	Determine the Fourier series representation and harmonic analysis for design.

**Course Contents:**

Unit	Description	Duration (Hrs.)
1.	<b>System of Linear Equations:</b> Rank of a matrix, System of linear equations, Linear dependence and independence of vectors, Linear and orthogonal transformations, Application to problems in engineering.	7
2.	<b>Eigen Values and Eigen Vectors, Diagonalization:</b> Eigen values and Eigen vectors, Cayley-Hamilton theorem, Diagonalization of a matrix, Reduction of quadratic forms to canonical form by linear and orthogonal transformations.	7
3.	<b>Differential Calculus:</b> Rolle's theorem, Mean value theorems, Taylor's series and Maclaurin's series, Expansion of functions using standard expansions, Indeterminate forms.	7
4.	<b>Partial Differentiation:</b> Partial derivatives of first and higher orders, Euler's theorem on homogeneous functions, Partial derivative of composite functions, Total derivative and Implicit differentiation	7
5.	<b>Applications of Partial Differentiation:</b> Jacobians and their applications, Errors and Approximations. Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers.	7
6.	<b>Fourier Series:</b> Definition, Dirichlet's conditions, Full range Fourier series, Half range Fourier series, Harmonic analysis.	7
<b>TOTAL</b>		<b>42</b>



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### Text Books:

1. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill
2. B. S. Grewal , "Higher Engineering Mathematics", Khanna Publication
3. Howard Anton & Chris Rorres , "Elementary Linear Algebra" , John Wiley & sons.
4. Seymour Lipschutz, Marc Lipson , "Schaum's outlines of Linear Algebra", 6th edition McGraw-Hill Education (India) Private Limited, New Delhi.

### Reference Books:

1. Erwin Kreyszig , "Advanced Engineering Mathematics" , Wiley Eastern Ltd.
2. M. D. Greenberg , "Advanced Engineering Mathematics" , Pearson Education.
3. Peter V. O'Neil , "Advanced Engineering Mathematics" , Thomson Learning.
4. P. N. Wartikar and J. N. Wartikar , "Applied Mathematics (Vol. I & Vol. II)", VidyarthiGrihaPrakashan, Pune.
5. Ron Larson and David C. Falvo, "Elementary Linear Algebra" ,Houghton Mifflin Harcourt Publishing Company

### E-Resources:

1. A NPTEL Course on "Engineering Mathematics-I" IIT Khargpur -  
<https://www.youtube.com/watch?v=4QFsiXfgbzM&list=PLbRMhDVUMngeVrxtbBz-n8HvP8KAWBpI5>
2. PaathshalaPandit , "Rank of Matrix | Vector Space | Engineering Mathematics" -  
<https://www.youtube.com/watch?v=jHU3yasfpKw&list=PLU4tRlorU5wWPpemhfdG0Yc4zNiICSMV0&index=1>
3. Eigenvalues and Eigenvectors | Properties and Important Result | Matrices-  
<https://www.youtube.com/watch?v=1wjXVdwzgX8>
4. Taylor Series | Numericals | Maths 1 | B.Tech 1<sup>st</sup> year | Engineering | BSc -  
<https://www.youtube.com/watch?v=0bHky1ocA1Y>
5. Partial Differentiation Example And Solution | Multivariable Calculus -  
<https://www.youtube.com/watch?v=eTp5wq-cSXY&list=PLU6SqYcYsfLuIJdHwY92aGBg5-uRHBOb&index=1>



## DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)					<b>Semester:</b> I				
<b>Course:</b> Engineering Physics					<b>Code:</b> 25ECBS102				
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	02	-	03	40	60	25	-	-	125

**Prerequisites:**

Fundamentals of Physics, basic of interference, polarization, de-Broglie hypothesis, semiconductor and ultrasonic.

**Course Objectives:**

1. To make the students understand and study the basic principles of Physics.
2. To provide firm grounding to the students in the concept of physics to resolve many engineering and technological problems.
3. To impart the knowledge of the fundamentals of physics to the students through hands on experiments and extend it to relevant engineering applications.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Explain basics of interference and polarization connected to engineering applications.
<b>CO2</b>	Make use of Laser technology and Optical fiber in various disciplines.
<b>CO3</b>	Outline the fundamentals of Quantum Physics and relate it to engineering applications.
<b>CO4</b>	Apply basics of semiconductors for solving the engineering problems.
<b>CO5</b>	Extend the understanding of Ultrasonic and NDT in engineering.
<b>CO6</b>	Interpret the use of nanoparticles and superconductors in the field of engineering.

**Course Contents:**

Unit	Description	Duration (Hrs.)
1.	<p><b>Wave Optics:</b>  <b>Units and its conversion</b>-Length, Mass, Velocity, Acceleration Momentum, Time, Temperature, Wavelength, Energy, Current, Voltage, Power, Intensity, Amplitude, Frequency, Pressure, Resistance, compressibility, resistivity, conductivity, Mobility, Angle.</p> <p><b>Interference-</b> Interference in thin film of uniform thickness and its conditions (Simple Numerical), Engineering Applications – Ant-Reflection coating (ARC).</p> <p><b>Polarization-</b> Polarization and its types, Malus law and Brewster's law (Simple numerical), Double refraction, Huygens's theory of double refraction, Differentiate between positive &amp; negative crystal, Engineering applications of polarization: Liquid Crystal Display (LCD).</p>	5
2.	<p><b>Laser and Optical Fiber:</b></p> <p><b>Laser-</b> Basic Principles of laser, Elements of Laser, Characteristics of laser, He-Ne laser (Gas laser), Applications of laser – Medical, Industrial and Holography- Recording.</p> <p><b>Optical fibers-</b> Propagation of light - Acceptance angle, Acceptance cone, Numerical aperture, Fractional Refractive Index Change (Simple numerical). Types of optical fibers, Advantages of optical fiber communication, Applications of optical fiber in Medical, Communication, Entertainment, Data Security.</p>	5



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3.	<p><b>Quantum Physics:</b>            de-Broglie hypothesis of matter waves, de-Broglie wavelength for a particle accelerated by Kinetic Energy (K.E) and a charged particle accelerated by Potential difference (PD) "V", (Simple Numerical), Properties of matter waves, Heisenberg's uncertainty principle for wide wave packet and narrow wave packet (Simple Numerical), Tunneling Effect, Engineering applications - Scanning Tunneling Microscope (STM), Introduction to Quantum Computing.</p>	4
4.	<p><b>Semiconductor Physics:</b>            Classification of solids on the basis of band theory, Fermi level for metal and semiconductor, Position of Fermi level in extrinsic semiconductors (only diagram), Solar cell: principle, working, IV-characteristics, Efficiency and fill factor, Factor to improve efficiency of solar cell, Application, advantages and disadvantages of solar cell, Hall effect: derivation for Hall voltage and Hall coefficient (Simple numerical).</p>	5
5.	<p><b>Ultrasonic and Non-destructive Testing:</b>  <b>Ultrasonic-</b> Properties of ultrasonic waves, Piezoelectric effect and inverse of piezoelectric effect, Generation of ultrasonic waves by inverse piezoelectric effect (using transistor), Compressibility of liquid by using ultrasonic waves (Simple Numerical).  <b>Non- Destructive Testing (NDT):</b> Definition and its objectives, Difference between destructive testing and non-destructive testing, Application of NDT as an Ultrasonic flaw detection technique (Simple numerical), Advantages of NDT.</p>	4
6.	<p><b>Nanophysics and Superconductivity:</b>  <b>Nanophysics-</b> Introduction of nanophysics, Properties of nanoparticles (Optical, Electrical, Mechanical), Applications of nanomaterials in Electronics, Automobile, Medical.  <b>Superconductivity-</b> Definition of superconductivity on the basis of temperature dependence of resistivity, Properties of Superconductors, Meissner effect, Critical magnetic field (Simple Numerical), Type I and Type II Superconductors, Engineering applications of superconductivity in Superconducting Quantum Interface Device (SQUID) with its principle, working, general application of superconductors - Power Transmission, electronics, medical, principle of Maglev train.</p>	5
<b>TOTAL</b>		<b>28</b>

### **List of Experiments:**

#### **Perform any (08) experiment out of 12:**

1. Experiment based on Newton's rings (determination of wavelength of monochromatic light, determine radius of curvature of Plano-convex lens).
2. Experiment based on polarization (To verify Law of Malus).
3. Determination of refractive index using Brewster's law.
4. Experiment based on Double Refraction (Determination of refractive indices / Identification of types of crystal).
5. Experiment based on Laser (Determination of thickness of wire / Number of lines on grating surface).
6. Determination of Planck's constant using available experimental setup.
7. To study IV characteristics of Solar Cell and determine parameters (fill factor and efficiency).



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8. To determine Hall coefficient and charge carrier density.
9. Determination of velocity of ultrasonic waves and compressibility of given liquid by using Ultrasonic Interferometer.
10. An experiment based on optical fiber. (To determine the numerical aperture acceptance angel acceptance cone of optical fiber of laser diode).
11. Experiment based on semiconductor (To determine the temperature dependence characteristics of semiconductor).
12. To determine the unknown wavelength by using plane diffraction grating.

### Text Books:

1. M. N. Avadhanulu and P.G. Kshirsagar, "Engineering Physics", S. Chand Publications.
2. S. O. Pillai, "Solid State Physics", New age International Publications.
3. J. J. Sakurai, "Modern Quantum Mechanics", Pearson Publication.
4. V K Mehta and Rohit Mehta, "Basic Electrical Engineering", S Chand Publications.
5. Robert L. Jaffe and Washington Tayler, "The Physics of Energy", Cambridge University Press".

### Reference Books:

1. H. D. Young and R. A. Freedman, "University Physics", Pearson Publication.
2. Resnick and Halliday, "Principles of Physics", John Wiley and Sons.
3. Jenkins and White, "Optics", Tata McGraw Hill.
4. Noson S. Yanofsky and Mirco A. Mannucci, "Quantum computing for computer scientists", Cambridge University Press

### E-Resources:

1. NPTEL Course:
  - a) NPTEL lecture based on interference of polarized light by IIT Roorkee - [https://youtu.be/e-4QK\\_JVsdu?si=gWIBt41dDgeABO8Y](https://youtu.be/e-4QK_JVsdu?si=gWIBt41dDgeABO8Y)
  - b) NPTEL lecture based on Introduction of Polarization by IIT Roorkee- <https://youtu.be/fIVlzKB4bBQ?si=meWFP5matsopCABi>
  - c) NPTEL lecture based on Malus Law by IIT Roorkee <https://youtu.be/iFG82I3nFA0?si=JCln6fJqGNw6ix5U>
  - d) NPTEL lecture based on Double Refraction by IIT Roorkee <https://youtu.be/Pt5wvYyguq0?si=4mowxORZQXGXNxMW>
  - e) NPTEL lecture based on Semiconductor Physics by IIT Roorkee - <https://youtu.be/q7VIITSysMs?si=621AMoJ2tMHKRiDH>
  - f) NPTEL lecture based on Introduction to superconductivity <https://youtu.be/hGPA1g8fKug?si=FdYfju6bf6u2zRe>
  - g) NPTEL lecture based on Meissner Effect- <https://youtu.be/EkNnxBakJMs?si=qRnSvPlD2NTe4rf->
2. Feynman lecture series: <https://www.feynmanlectures.caltech.edu/>
3. Concepts of Modern Physics, Arthur Beiser: - [https://nitsri.ac.in/Department/PHYSICS/Beiser\\_Modern\\_Physics.pdf](https://nitsri.ac.in/Department/PHYSICS/Beiser_Modern_Physics.pdf)
4. Lectures by Walter Lewin: <https://www.youtube.com/channel/UCiEHVhv0SBMpP75JbzJShqw>



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5. Quantum Mechanics Lecture Series by Prof. H.C.Verma -  
[https://www.youtube.com/watch?v=JFWuAQRZPjQ&list=PLWweJWdB\\_GuISnGkAafMpzzDBvTHg02At](https://www.youtube.com/watch?v=JFWuAQRZPjQ&list=PLWweJWdB_GuISnGkAafMpzzDBvTHg02At)
6. Virtual Labs, Amrita University- <https://vlab.amrita.edu/?sub=1&brch=195>
7. Virtual Labs, IIT Kanpur- <https://bop-iitk.vlabs.ac.in/exp/energy-band-gap/simulation.html>



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<b>Program:</b> B. Tech. (Electronics and Computer Engineering)								<b>Semester:</b> I	
<b>Course:</b> Basic Electronics Engineering								<b>Code:</b> 25ECES101	
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Credit</b>	<b>CIE</b>	<b>ETE</b>	<b>TW</b>	<b>OR</b>	<b>PR</b>	<b>Total</b>
03	02	-	04	40	60	50	-	-	150

**Prerequisites:**

1. Basic understanding of electric circuits and components.
2. Knowledge of basic physics concepts such as electricity, magnetism, and semiconductor behavior.
3. Understanding of basic digital electronics principles like logic gates and number systems.

**Course Objectives:**

1. To understand the fundamentals of passive electronic components and semiconductor materials.
2. To master the principles and applications of diodes and special purpose diodes.
3. To familiarize with transistor operation, configurations, and applications.

**Course Outcomes:** After completion of this course, students will able to -

<b>CO1</b>	Demonstrate proficiency in analyzing and designing electronic circuits utilizing passive components.
<b>CO2</b>	Explain p-n junction diode and VI characteristics.
<b>CO3</b>	Apply knowledge of transistor characteristics and configurations in circuit design.
<b>CO4</b>	Utilize operational amplifiers in electronic circuit design and analysis.
<b>CO5</b>	Recognize the principles of electronic measurements and instrumentation.
<b>CO6</b>	Explain basic digital number system conversion.

**Course Contents:**

<b>Unit</b>	<b>Description</b>	<b>Duration (Hrs.)</b>
1.	<p><b>Introduction to Electronics Components:</b>            Introduction to Electronics: Evolution of Electronics, Impact of Electronics in industry and society.            Introduction to Passive Components: Classification, Specifications and Color coding techniques of Resistors, Capacitors, Inductors.            Introduction to Active Components: Construction, Types and Applications.</p>	6
2.	<p><b>Semiconductor materials:</b>            Semiconductors: P-type and N-type, Current in semiconductors: Diffusion and Drift Current.            P-N Junction Diode: Construction, working in forward and reverse bias, V-I characteristics, Diode applications: Diode as a switch, Diode as Rectifier: HWR, FWR, BR, Specifications of Rectifier diodes.            Special purpose diodes: Zener diode: V-I Characteristics, Specification and Zener as voltage regulator, Light Emitting Diode (LED) and photo diode.</p>	8
3.	<p><b>Transistor Circuits:</b>            Transistors: Construction, types, operation, Characteristics and region of operation, CB, CE, CC configurations, BJT as a switch and CE amplifier.            FET: Introduction, Construction, Operation, V-I characteristics.</p>	8



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	Metal Oxide Semiconductor Field Effect Transistors (MOSFET): Types of MOSFET, n- Channel E-MOSFET : Construction, Operation, V-I characteristics.	
4.	<b>Linear Integrated Circuits:</b> Introduction to Op-amp, Functional block diagram of operational amplifier, idea land practical parameters, Concept of negative& positive feedback, Applications-Inverting and Non inverting amplifier. IC 555 timer as an oscillator, voltage regulation , IC voltage regulators(Three Pin)	6
5.	<b>Electronic Measurements and Instrumentation:</b> Electronics measurements: Frequency measurements and conversions in various units like Hz, KHz, MHz etc, and Voltage, current and power Measurement units, measurement units for resistance, conductance, impedance, capacitance and inductance. Electronic Instruments: Principles and block diagram of digital multimeter, Function Generator, Digital Storage Oscilloscope (DSO) Power scope, AC/DC power supply, Auto transformer, Analog ammeter and voltmeter.	7
6.	<b>Digital Number System and Boolean Algebra:</b> Introduction: Binary, Octal, Decimal, Hexadecimal numbers, and its conversion. Signed Binary number representation: Signed Magnitude, 1's complement and 2's complement representation. Binary, Octal, Hexadecimal Arithmetic: 2's complement arithmetic. Boolean algebra and logic Gates: Boolean algebra, Basic theorems and properties of Boolean algebra. Logic Gates, DeMorgan's theorem.	7
<b>TOTAL</b>		<b>42</b>

### **List of Experiments:**

**Perform any Seven (07) experiments from Exp. No 1 to 9, 10<sup>th</sup> is compulsory:**

1. Study of Active and Passive components: Resistors (Fixed & Variable), Calculation of resistor value using color code, Capacitors (Fixed & Variable), Inductors, Devices such Diode, BJT, MOSFETs, various IC packages, Switches & Relays.
2. Measurements using various measuring equipments:
  - i) Set up CRO and function generator for measurement of voltage, frequency.
  - ii) Obtain the phase shift between to signals using CRO with the help of Lissagous pattern.
  - iii) Measure voltage, resistance using digital multimeter. Also use multimeter to check diode, BJT.
3. Build and test circuits using Semiconductor devices and Plot V-I characteristics:
  - i) P-N Junction Diode (Study the datasheet of typical PN junction diode 1N 400X).
  - ii) Zener Diode (Study the datasheet of typical Zener diode 1N 4148).
4. Build and test Rectifier circuits:
  - i) Implement half wave, full wave and bridge rectifier using diodes.
  - ii) Observe the effect of capacitor filter on rectifier output.
5. Study of Single stage BJT Common Emitter amplifier circuits.
  - i) Identify pins of a BJT (Such as BC547) and Study its datasheet specifications.
  - ii) To measure voltage and observe waveforms at input and output terminals of single stage BJT Common Emitter amplifier circuits.
  - iii) Calculate Voltage Gain of the amplifier.



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6. Study of Op-amp based amplifier circuits: Build inverting and non-inverting amplifier using op-amp (Study the datasheet of typical Op-Amp 741)
7. Study of IC 555 Timer Circuits.
  - i) Identify pins of IC 555 Timer Circuits.
  - ii) Observe output waveforms and measure frequency of output of IC 555 Timer used in Astable Mode.
8. Study of convergence of number system:
  - i) a) Convert the any number system into its Binary equivalent.
  - ii) b) Convert the any number system into its Octal equivalent.
  - iii) c) Convert the any number system into its Decimal equivalent.
  - iv) d) Convert the any number system into its Hexa decimal equivalent.
9. Verify truth table of Basic Gates.
10. Case Study of any one electronics appliances with block diagram, specification etc. **(Compulsory)**

### Text Books:

1. Thomas. L. Floyd, "Electronics Devices", 9<sup>th</sup> Edition, Pearson.
2. R.P. Jain, "Modern Digital Electronics", 4<sup>th</sup> Edition, Tata McGraw Hill.
3. H.S. Kalsi, "Electronic Instrumentation", 3<sup>rd</sup> Edition, Tata McGraw Hill.
4. D. Patrnabis, "Sensors and Transducers", 2<sup>nd</sup> Edition, PHI.

### Reference Books:

1. Donald A. Neamen, "Semiconductor Physics and Devices", McGraw-Hill Higher Education, 2011.
2. Paul Horowitz and Winfield Hill, "The Art of Electronics", Cambridge University Press.
3. Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", Prentice Hall, 2000 Education.
4. Brian R. Jones "Principles of Electronic Instrumentation", Prentice Hall.
5. Ramon Pallas, Areny and John G. Webster, "Sensors and Signal Conditioning", Wiley.

### E-Resources:

1. MIT Open CourseWare – Electronics  
<https://ocw.mit.edu/courses/6-002-circuits-and-electronics-spring-2007/>
2. NPTEL - Electronics & Communication Engineering  
<https://archive.nptel.ac.in/courses/117/105/117105144/>
3. All About Circuits  
<https://www.allaboutcircuits.com/>
4. Electronics Hub  
<https://www.electronicshub.org/>

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)	<b>Semester:</b> I								
<b>Course:</b> Electronics Circuit Design	<b>Code:</b> 25ECES102								
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	02	-	03	40	60	50	25	-	175

**Prerequisites:**

Basics of physics

**Course Objectives:**

1. To enable students to comprehend and identify various electronic symbols and components used in electrical and electronic circuits.
2. To develop the ability to design and analyze basic electronic circuits involving resistors, capacitors, inductors, and special purpose diodes.
3. To equip students with the skills to apply PCB design guidelines and construct oscillator and amplifier circuits effectively.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Identify and interpret the symbols for various electronic components, demonstrating foundational knowledge.
<b>CO2</b>	Calculate the equivalent capacitance, resistance, and inductance in series and parallel circuits.
<b>CO3</b>	Design and analyze circuits using special purpose diodes, including Zener and tunnel diodes.
<b>CO4</b>	Test and troubleshoot electronic components and circuits using millimeters and oscilloscopes.
<b>CO5</b>	Develop PCB layouts following standard guidelines for single-sided and double-sided boards.
<b>CO6</b>	Design, construct, and analyze various types of oscillators and amplifiers, applying theoretical concepts to practical implementations.

**Course Contents:**

Unit	Description	Duration (Hrs.)
1.	<b>Introduction to electronics Symbols:</b> Series and parallel connections of resistors, capacitor, and inductors, Calculation of equivalent capacitance resistance and inductance, symbols of LDR, potentiometer, 555, toggle switch, USB, Interface and Connector, Reset Button, Power button, Digital Input/output pins, Analog Pins, Microprocessor and Microcontroller block diagram	5
2.	<b>Introduction electrical component and Symbol:</b> D.C., A.C., Positive, Negative, Single Phase A.C. 50 Hz, Three Phase A.C., 50 Hz, A.C. / D.C., 3-Phase line, Neutral line, Earth, Cell, Photo voltaic cell, Battery, Single pole single throw switch, Push-button switch, Energy meter, Alternator, Generator, D.C. Motor, Two-way switch, Fuse, Socket 2 pin, 3 pin, Aerial / Antenna, Voltmeter, Ammeter, Relay contacts, Transformer tapped secondary, Shielded wire,	5
3.	<b>Circuit Design with special purpose diode:</b> Zener Diode Applications: As reference voltage device, In constant current source with transistor, In over voltage protection, In clipping and clamping circuit, Clipper and clamper circuit, Dc power supply drawing, The Laser Diode, Optoisolator, Tunnel Diode, Tunnel Diode Oscillator, Varactor Diode, Application of Varactor Diode, Shockley Diode Testing of components using millimeter or oscilloscope	5

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4.	<b>Circuit Design with Electronics components:</b> Construction and symbols of IGBT, SCR, TRIAC, DIAC, Design of Instrumentation amplifier, Applications of IGBT, SCR, TRIAC, and DIAC.	5
5.	<b>PCB Design guidelines:</b> Introduction, Layout, Layout scale, Layout approach, Layout Procedure, PCB Types and Sizes: Single sided PCB and Double sided PCB.	4
6.	<b>Design of oscillator and Amplifier:</b> Oscillator design: Crystal Oscillator, Hartley oscillator, RC Phase Shift Oscillator, Colpitts Oscillators, Wien Bridge Oscillator. <b>Amplifier:</b> Class A Amplifier, Class B Amplifier, Class AB Amplifier, Class C Amplifier	4
<b>TOTAL</b>		<b>28</b>

**List of Experiments:**

**Total 9 experiments: Any 4 experiment from 1 to 7 should be drawn on Sheets. 10<sup>th</sup> Experiment is compulsory. Any 3 experiments from 11 to 15. Any One experiment from 8 and 9.**

1. Draw the symbols of various electronics and Electrical components: D.C., A.C. Positive. Negative. Single Phase A.C. 50 Hz. Three Phase A.C., 50 Hz. A.C. / D.C. 3-Phase line, Earth, Cell, Battery, Single pole single throw switch, Push-button switch, Energy meter, Alternator, Generator, D.C. Motor.
2. Draw the symbols of various electronics and Electrical components: A.C. Motor Single phase, 3-phase squirrel cage motor, 3-phase slip ring motor. Capacitor: Fixed, variable, Electrolytic Capacitor, Two-way switch, Fuse, Socket 2 pin, 3 pin, Aerial / Antenna, Voltmeter, Ammeter, Ohm Meter, Watt Meter, Lamp, Electric bell, Buzzer, Connections: star, Delta, Choke, Transformers, Resistor : Fixed, Resistor: variable, Diode , Auto transformer.
3. Draw the symbols of various electronics and Electrical components: Zener diode, Schottky diode, SCR, TRIAC, PNP transistor, NPN transistor, FET N-channel, FET P-channel, Unijunction transistor.
4. Draw inverter will once again connect the load, which are connected to its output to the main supply.
5. Draw Lamp dimmer cum universal speed controller circuit.
6. Draw circuit connections of a 12V, 1A regulated power supply using 7812.
7. Draw circuit of Stepped voltage stabilizer-manual.
8. Testing or measuring various electronics/electrical components using millimeter or oscilloscope.
9. Soldering techniques.
10. Design circuit with connection of resistors, capacitor in series and parallel. Simulate and measure voltages at each point. (**Compulsory**)
11. Design circuit drawing using Diode and special purpose diode and simulate it.
12. Design Simulate Battery and LEDs connected with switch measure voltages at each point
13. Design and simulate logic for controlling LED by using two switches.
14. Design and simulate Inverting and non-inverting amplifier
15. Design and simulate DC power supply and measure the voltages.

**Text Books:**

1. V.R. Deo, "Electronic Components & Application", Ane Books Pvt, Ltd.
2. Dwivedi and Tripathi, "Fundamentals of Electrical Engineering", Wiley Publication

**Reference Books:**

1. Paul Horowitz, Hill, "The art of Electronics", Cambridge University Press.
2. Floyd, "Electronics Devices", Pearson Publications.
3. O.N. Pandey, "Electronics Engineering", Ane Books Pvt, Ltd.



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4. Daniel Shanefield, "Industrial Electronics", Noyes Publications.
5. Ganesh Babu and Suseela, "Linear Integrated circuit", Scitech Publications.
6. J.R. Cogdell, "Foundation of Electronics", Prentice Hall.
7. B.D.Shinde and Gitapathi, "Electronics and instrument System Design", Center of Technical Coordination.

### E-Resources:

1. Electrical and Electronics Symbols and Meanings:  
<https://www.edrawmax.com/article/electrical-and-electronic-symbols.html>
2. Electronics Tutorials:  
<https://www.electronics-tutorials.ws/resources/basic-schematic-symbols.html>
3. Electronics symbols: <https://www.electronicshub.org/symbols/>

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)	<b>Semester:</b> I								
<b>Course:</b> IT Proficiency	<b>Code:</b> 25ECVS101								
<b>Teaching Scheme (Hrs/week)</b>	<b>Evaluation Scheme (Marks)</b>								
<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Credit</b>	<b>CIE</b>	<b>ETE</b>	<b>TW</b>	<b>OR</b>	<b>PR</b>	<b>Total</b>

-	04	-	02	-	-	25	-	-	25
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**Prerequisites:**

Basic Computer Skills

**Course Objectives:**

1. To develop proficiency in essential office software and tools, including MS Word, MS Excel, MS PowerPoint, and LaTeX, to create, analyze, and present professional documents and data effectively, while understanding ethical internet use and leveraging AI tools.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Create and format professional documents using MS Word.
<b>CO2</b>	Organize and analyze data using Excel's features.
<b>CO3</b>	Apply advanced Excel functions, pivot tables, charts, and macros to analyze and secure data.
<b>CO4</b>	Create effective presentations using MS PowerPoint features.
<b>CO5</b>	Create Professional Documents Using LaTeX.
<b>CO6</b>	Apply ethical practices in using internet resources and AI tools.

**Course Contents:**

<b>Unit</b>	<b>Description</b>	<b>Duration (Hrs.)</b>
1.	<b>Basics of Computer and MS Word:</b> Awareness of computer Basics <b>MS-Word:</b> Text Basics, Text Formatting and saving file, Working with objects, Header & footers, Working with bullets and numbered lists, Tables, Styles and Content, Merging documents, Sharing and maintaining document, Proofing the document, Printing.	08
2.	<b>MS-Excel:</b> Introduction to Excel, Formatting excel work book, Perform calculations with functions, Sort and Filter data with Excel, Create effective 2D and 3D charts to Present data visually.	10
3.	<b>Advance MS-Excel:</b> Analyze data using pivot tables and pivot charts, Protecting and sharing the work book, Use Macros to automate tasks, Proofing and Printing, More useful functions in excel, Goal seek and scenario features, V-lookup and H-lookup functions, Advanced sort and filter in excel.	10
4.	<b>MS-PowerPoint:</b> Setting up PowerPoint environment, Creating slides and applying themes, Working with bullets and numbering, Working with objects, Hyperlinks and action buttons, Working with movies and sounds, Using SmartArt and Tables, Animation and slide transition, Using slide master, Slide show option, Proofing and Printing.	10
5	<b>Introduction to Latex:</b> Installation of the software LaTeX, Understanding Latex compilation, Basic Syntax, Writing equations, Matrix, Tables. <b>Page Layout</b> – Titles, Abstract Chapters, Sections, References, Equation references, citation. List making environments, Table of contents, Generating new commands, Figure handling, Numbering, List of figures, List of tables, Generating index.	10

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

	<b>Packages</b> - Geometry, Hyperref, amsmath, amssymb, algorithms, algorithmic graphic, color, tilez listing. Classes: article, book, report, beamer, slides. IEEtran. <b>Applications</b> - Writing Resume, Writing articles/ research papers, project report.	
6	<b>Internet Ethics &amp; AI tools</b> Working with Internet and-mail, Using the Internet, Internet Ethics and Safety, Social Media. <b>AI Tools:</b> Jasper, GitHub Copilot, Synthesia, Writesonic.	08
	<b>TOTAL</b>	<b>56</b>

**List of Experiments:**

1. Create a collaborative document project where multiple users contribute to a document using MS Word's track changes and commenting features.
2. To analyze and visualize data effectively using Excel's functions and charts, aiming to create insightful and dynamic data visualizations.
3. Develop a financial modeling project using Excel, incorporating advanced functions like goal seek, scenario analysis, and pivot tables. Build automation using macros for repetitive tasks.
4. Create an interactive multimedia presentation on a complex topic of interest. Incorporate animations, transitions, embedded videos, and interactive elements like hyperlinks and action buttons.
5. Design and implement a digital marketing campaign for a fictitious product or service. Create email newsletters, social media posts, and analyze campaign performance metrics.
6. Prepare research article using Latex.

**Text Books:**

1. Banerjee Snigdha, "MS Word 2000", New Age International.
2. Quentin Docter, Q., et al., "CompTIA IT Fundamentals Study Guide: Exam FC0-U61", Wiley, USA.
3. Lambert, J., Frye, C., et al., "Microsoft Office 2019 Step by Step", Microsoft Press, USA.

**Reference Books:**

1. Walkenbach John, "Excel 2013 Bible", Wiley Publishing House.
2. Wempen Faithe, "Microsoft PowerPoint 2010 Bible", Wiley Publishing House.
3. Miller, M., "Internet Basics Absolute Beginner's Guide", Que Publishing, USA.
4. Miller, M., "Computer Basics Absolute Beginner's Guide", Que Publishing, USA.

**E-Resources:**

1. Microsoft Office Support provides tutorials and guides for MS Office applications.  
<https://support.microsoft.com/en-us/training>
2. Digital Skilling by NPTEL - <https://elearn.nptel.ac.in/shop/nptel/digital-skilling/?v=c86ee0d9d7ed>



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**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)				<b>Semester:</b> I				
<b>Course:</b> Professional Development – I				<b>Code:</b> 25ECCC101				
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>				
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR
-	04	-	02	-	-	50	-	-

**Course Objectives:**

1. To introduce students on professional development skills and its importance in building personal and professional life.
2. To bring in self-awareness and realization of Values, Self-discipline and self-grooming for betterment of life and contribution to our Society.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Know their own values and how to use in their career and personal life.
<b>CO2</b>	Understand the importance of self-discipline and how it can empower individuals to take control of their actions and decision in any situation.
<b>CO3</b>	Know the importance of self-grooming to maintain good health and self-confidence.

**Course Contents:**

Unit	Description	Duration (Hrs.)
1.	<b>Values:</b> Understand, Know, Define and Use of your Values, Types of Values, Internal and External Stakeholders, What is SWOT analysis and how to do, Action planning and execution, Self-review.	24
2.	<b>Self-discipline:</b> Definition, Self-discipline impact in your life and society, Techniques to build self-discipline, Self-review and actions.	16
3.	<b>Self-grooming:</b> What is personal grooming and its importance, Making Self-care guide and practice, Self-care for health and well-being.	16
<b>TOTAL</b>		56

**Text Books:**

1. R. Srinivasan, "Strategic Management: Text and Cases", PHI Publication.
2. M. K. Sinha, "Success Through Self-Discipline: Your Personal Guide to Achieving Your Goals".

**Reference Books:**

1. Stephen R. Covey, "The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change", Simon & Schuster, 1989.
2. Jack Canfield, "The Success Principles", HarperCollins, 2005.
3. Norman Vincent Peale, "The Power of Positive Thinking", Prentice Hall, 1952.

**E-Resources:**

1. Coursera: "The Science of Well-Being" by Yale University, -  
<https://www.coursera.org/learn/the-science-of-well-being>
2. Udemy: "Self-Care: Take Care of Yourself to Better Take Care of Others" by Jessica Rogers  
<https://www.udemy.com/course/caring-self/?couponCode=UPGRADE02223>

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)					<b>Semester:</b> I					
<b>Course:</b> Liberal Learning – I (Guitar)					<b>Code:</b> 25ECCC102A					
<b>Teaching Scheme (Hrs/week)</b>					<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit		CIE	ETE	TW	OR	PR	Total
-	02	-	01		-	-	25	-	-	25

**Prerequisites:**

Basic knowledge of Indian classical music and Guitar musical instrument.

**Course Objectives:**

1. To build a strong foundation in Indian classical dance through mastering basic techniques, rhythms, expressions, and repertoire, culminating in a performance.

**Course Outcomes:** After completion of this course, students will be able to -

**CO1** Illustrate the fundamental aspects of Guitar instrument.

**CO2** Demonstrate the performance of Guitar Instrument.

**CO3** Apply different types Chords.

**CO4** Apply basic outline through various prescribed ragas practically.

**Course Contents:**

Sr. No.	Description	Duration (Hrs.)
1.	Introduction to the Guitar	2
2.	Understanding standard tuning	2
3.	Introduction to tablature and note reading	2
4.	Introduction to basic music theory concepts	2
5.	Understanding scale, intervals, and chords	2
6.	Learning more open chords: D major, D minor, C major, G major	2
7.	Understanding power chords and their shapes	2
8.	Understanding barre chord shapes: F major, B minor	2
9.	Finding Chords by Ear	2
10.	Chord Progressions	2
11.	Advanced Chord Types	2
12.	Transposing Chord	2
13.	Review and Practice	2
14.	Introduction to Scales	2
<b>TOTAL</b>		<b>28</b>

**Text Books:**

1. David Hodge, "Guitar Theory", DK Publishing.

**Reference Books:**

1. Russ Shipton, "The Complete Guitar Player", Published by Wise.
2. Vincent Ong, Alfred Khp, "Classical Guitar Advanced Studies Repertoires", Dynamic Publication.

**E-Resources:**

1. <https://www.youtube.com/watch?v=BBz-Jyr23M4>



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**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)					<b>Semester:</b> I					
<b>Course:</b> Liberal Learning – I (Singing)					<b>Code:</b> 25ECCC102B					
<b>Teaching Scheme (Hrs/week)</b>					<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit		CIE	ETE	TW	OR	PR	Total
-	02	-	01		-	-	25	-	-	25

**Prerequisites:**

Basic knowledge of Indian classical music in singing.

**Course Objectives:**

1. To offer students' knowledge of the basic concepts of Singing in a very easy to understand manner with their practical applicability.

**Course Outcomes:** After completion of this course, students will be able to -

**CO1** Illustrate the fundamental aspects of Singing.

**CO2** Demonstrate the performance of Singing.

**CO3** Apply basic outline through various prescribed ragas practically.

**Course Contents:**

Sr. No.	Description	Duration (Hrs.)
1.	Voice Culture in Indian Semi Classical Singing.	2
2.	Basics of Singing o Introduction to semi classical singing.	2
3.	Basics of Indian Semi Classical Music.	2
4.	Learning Basic Ragas.	2
5.	Music Theory Basics.	2
6.	Vocal Warm-ups.	2
7.	Introduction to Ear Training.	2
8.	Breathe Control.	2
9.	Resonance and Tone Production.	2
10.	Diction and Articulation.	2
11.	Dynamics and Expression.	2
12.	Introduction to Repertoire.	2
13.	Practice Techniques.	2
14.	Interpretation and Expression.	2
<b>TOTAL</b>		<b>28</b>

**Text Books:**

1. Dr. Theodore Dimon, "Anatomy of the Voice, This Is a Voice".

**Reference Books:**

1. Richard Miller, "The Structure of Singing", Schirmer Books, London.
2. Jennifer Hamady, "The Art of Singing", Published by Hal Leonard.

**E-Resources:**

1. <https://www.youtube.com/watch?v=4hNq9qykOyE>
2. <https://www.youtube.com/watch?v=b14gkmECz-Y>



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**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)					<b>Semester: I</b>				
<b>Course:</b> Liberal Learning – I (Cinematography)					<b>Code:</b> 25ECCC102C				
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25

**Prerequisites:**

A basic understanding of film theory, Camera operation, Lighting techniques and visual storytelling is essential for cinematography.

**Course Objectives:**

1. To make students effectively use their camera's components, study fundamental photography techniques and apply basic to advanced editing skills.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Illustrate the fundamental aspects of camera equipment.
<b>CO2</b>	Demonstrate the performance of camera equipment
<b>CO3</b>	Ability to translate creative concepts into visually engaging and coherent film or video projects.
<b>CO4</b>	Mastery in crafting compelling visual narratives through camera angles, lighting, and composition

**Course Contents:**

Sr. No.	Description	Duration (Hrs.)
1.	Introduction to Photography	2
2.	Understanding camera components (lens, shutter, sensor)	2
3.	Exposure Triangle	2
4.	Introduction to the rule of thirds, leading lines, and framing	2
5.	Understanding autofocus vs. manual focus	2
6.	Introduction to natural and artificial lighting	2
7.	White Balance and Color Theory	2
8.	Motion and Long Exposure	2
9.	Basics of portrait photography	2
10.	Basics of landscape photography	2
11.	Overview of post-processing software (e.g., Adobe Light room, Photoshop)	2
12.	Introduction to advanced editing tools	2
13.	Organizing and Storing Photos	2
14.	Final Project Presentation and Review	2
<b>TOTAL</b>		<b>28</b>

**Text Books:**

1. Tania Hoser, "Introduction to Cinematography", Taylor & Francis.

**Reference Books:**

1. Anat Pick, "Screening Nature", Berghahn Books.
2. Blain Brown, "Cinematography: Theory and Practice", Taylor & Francis.

**E-Resources:**

1. <https://youtu.be/V7z7BAZdt2M?si=to4yQ46zEKRbxK0m>
2. [https://youtu.be/WXdAX0No2hM?si=GZu\\_mJsmyJ7NGnAU](https://youtu.be/WXdAX0No2hM?si=GZu_mJsmyJ7NGnAU)

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)				<b>Semester:</b> I					
<b>Course:</b> Liberal Learning – I (Dance)				<b>Code:</b> 25ECCC102D					
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25

**Prerequisites:**

Good stamina, flexibility and familiarity with simple rhythmic patterns and beats.

**Course Objectives:**

1. To build a strong foundation in Indian classical dance through mastering basic techniques, rhythms, expressions, and repertoire, culminating in a performance.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Understand the fundamental postures, hand gestures and basic steps of Indian classical dance.
<b>CO2</b>	Understand and perform dance sequences to various rhythmic cycles (Tala) with confidence.
<b>CO3</b>	Convey emotions and stories through facial expressions (Abhinaya) and body language.

**Course Contents:**

Sr. No.	Description	Duration (Hrs.)
1.	Overview of Indian Classical Dance	2
2.	Fundamental Postures and Hand Gestures (Hasta Mudras)	2
3.	Introduction to Basic Steps (Adavus or Tatkars)	2
4.	Rhythmic Patterns and Clapping (Tala)	2
5.	Advanced Basic Steps	2
6.	Strength and Conditioning	2
7.	Introduction to Basic Expressions (Abhinaya)	2
8.	Integrating Steps and Expressions	2
9.	Intermediate Rhythmic Patterns	2
10.	Improvisation and Creative Movement	2
11.	Introduction to Advanced Movements	2
12.	Review and Feedback	2
13.	Learning a Simple Dance Piece - Part 1	2
14.	Learning a Simple Dance Piece - Part 2	2
<b>TOTAL</b>		<b>28</b>

**Text Books:**

1. Padma Subrahmanyam, "Indian Classical Dance: A Beginner's Manual", Abhinav Publications.

**Reference Books:**

1. Dr. Aditi Sriram, "Indian Classical Dance: A Guide", Vikas Publishing House.

**E-Resources:**

1. [https://youtu.be/5apCTHzvkWI?si=p11CR\\_4XxPocTbjO](https://youtu.be/5apCTHzvkWI?si=p11CR_4XxPocTbjO)
2. <https://youtu.be/OIKOHzePJCA?si=7pnPZKuvfT5EIWhf>

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)					<b>Semester:</b> I				
<b>Course:</b> Synthesizer (Keyboard)					<b>Code:</b> 25ECCC102E				
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25

**Prerequisites:**

Basic knowledge of Indian classical music and Keyboard musical instrument.

**Course Objectives:**

1. To offer students' knowledge of the basic concepts of playing Keyboard in a very easy to understand manner with their practical applicability.

**Course Outcomes:**

<b>CO1</b>	Illustrate the fundamental aspects of Keyboard instrument.
<b>CO2</b>	Demonstrate the performance of Keyboard Instrument.
<b>CO3</b>	Apply different types of Chords.
<b>CO4</b>	Apply basic outline through various prescribed ragas practically.

**Course Contents:**

Sr. No.	Description	Duration (Hrs.)
1.	Introduction to the Keyboard	2
2.	Understanding Notes and Keys	2
3.	Basic Music Theory	2
4.	Introduction to the C major scale	2
5.	Learning to play simple melodies in C major	2
6.	Introduction to Chords	2
7.	Combining Melodies and Chords	2
8.	Review and practice melodies and chords	2
9.	Introduction to Minor Scales	2
10.	Introduction to additional chords (D major, E minor)	2
11.	Understanding chord progressions (e.g., I-IV-V)	2
12.	Review scales, chords, and progressions	2
13.	Introduction to Arpeggios	2
14.	Dynamics and Expression	2
<b>TOTAL</b>		<b>28</b>

**Text Books:**

1. Chuan C. Chang, "Fundamentals of Piano Practice", Create space Independent Publishing Platform.

**Reference Books:**

1. Michael Rodman, "Keyboard for the Absolute Beginners", Alfred Publishing.
2. Davis Dorrough, "Piano Scales".

**E-Resources:**

1. [https://youtu.be/2mPS-2guHVo?si=8X\\_4KKezIdrMejLH](https://youtu.be/2mPS-2guHVo?si=8X_4KKezIdrMejLH)
2. <https://youtu.be/tEtukfFv3Wk?si=2iJ8wdD0dfjWauPb>

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)					<b>Semester:</b> I				
<b>Course:</b> Liberal Learning – I (Basketball)					<b>Code:</b> 25ECCC102F				
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25

**Prerequisites:**

Proper health, Basic knowledge of rules of the game.

**Course Objectives:**

1. Develop foundational basketball skills, including dribbling, passing, shooting, and defense, while understanding game rules and strategies through practical gameplay and scrimmage.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Demonstrate basic basketball skills such as dribbling, passing, shooting, and defensive fundamentals effectively.
<b>CO2</b>	Apply offensive and defensive strategies, including transition play, during gameplay and scrimmages.
<b>CO3</b>	Understand and implement basketball game rules and referee gestures accurately in practical situations.

**Course Contents:**

Sr. No.	Description	Duration (Hrs.)
1.	Introduction to Basketball	2
2.	Basic Skills – Dribbling	2
3.	Basic Skills- Passing	2
4.	Basic Skills- Shooting	2
5.	Defensive Fundamentals	2
6.	Rebounding Basics	2
7.	Ball Handling & Control	2
8.	Shooting Mechanics	2
9.	Offensive Strategies	2
10.	Defensive Strategies	2
11.	Transition Play	2
12.	Gameplay & Scrimmage	2
13.	Game Rules , Refree Gestures	2
14.	Practical	2
<b>TOTAL</b>		<b>28</b>

**Text Books:**

1. K.K. Sharma, "Basketball: Skills and Drills", Sports Publications.

**Reference Books:**

1. Dr. P.K. Kher, "Basketball Coaching: A Complete Guide", Khel Prakashan.
2. S. Reddy, "The Ultimate Guide to Basketball Training", Blue Rose Publisher.

**E-Resources:**

1. Introduction to Exercise Physiology & Sports Performance, IIT Madras, <https://nptel.ac.in/courses/109106406>

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)				<b>Semester:</b> I					
<b>Course:</b> Liberal Learning – I (Cricket)				<b>Code:</b> 25ECCC102G					
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25

**Prerequisites:**

Proper health, Basic knowledge of rules of the game.

**Course Objectives:**

1. To Enhance cricket skills from basics to advanced techniques, focusing on tactics, fitness, and specialized fielding and wicket keeping through targeted practice and match simulations.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Master fundamental and advanced cricket techniques, including batting, bowling, and specialized fielding and wicket keeping.
<b>CO2</b>	Demonstrate an understanding of game scenarios and tactical strategies, applying them effectively during match simulations and pressure situations.
<b>CO3</b>	Improve physical fitness, strength, and conditioning, with targeted skill enhancement and mid-season assessments to track progress.

**Course Contents:**

Sr. No.	Description	Duration (Hrs.)
1.	Introduction and Fundamentals.	2
2.	Basic Techniques.	2
3.	Introduction to Game Scenarios.	2
4.	Physical Fitness and Match Simulations.	2
5.	Advanced Batting Techniques	2
6.	Advanced Bowling Techniques	2
7.	Specialized Fielding and Wicket keeping	2
8.	Tactical Understanding	2
9.	Refining Batting Techniques	2
10.	Refining Bowling Techniques	2
11.	Fielding Under Pressure	2
12.	Strength and Conditioning	2
13.	Targeted Skill Improvement	2
14.	Mid-Season Assessment	2
<b>TOTAL</b>		<b>28</b>

**Text Books:**

1. Sanjay Manjrekar, "Cricket Fundamentals", Orient BlackSwan
2. Ravi Shastri, "Winning Cricket: Skills and Strategies", Notion Press

**Reference Books:**

1. Sachin Tendulkar, "Playing It My Way", Hachette India
2. Rahul Dravid, "Cricket: The Game of Life", Penguin India

**E-Resources:**

1. Sports and Performance Nutrition, IIT Madras, [https://onlinecourses.nptel.ac.in/noc24\\_hs82/](https://onlinecourses.nptel.ac.in/noc24_hs82/)

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)				<b>Semester:</b> I					
<b>Course:</b> Liberal Learning – I (Rifle and Pistol Shooting)				<b>Code:</b> 25ECCC102H					
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25

**Prerequisites:**

Proper health, Basic knowledge of rules of the game.

**Course Objectives:**

1. Develop fundamental skills in rifle and pistol shooting through technical knowledge, practical drills, and mental preparation for competitive performance.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Master fundamental and advanced shooting techniques for both rifle and pistol, including aiming, breathing, and triggering.
<b>CO2</b>	Develop strong mental focus and relaxation techniques essential for high-performance shooting and competition readiness.
<b>CO3</b>	Gain hands-on experience in live shooting drills and positional shooting, preparing them for competitive shooting scenarios.

**Course Contents:**

Sr. No.	Description	Duration (Hrs.)
1.	Introduction about shooting game	2
2.	Basic technical knowledge	2
3.	Technique Refinement( aiming, breathing and triggering)	2
4.	Learning about live shooting and technics	2
5.	Practicing standard Positional rifle Shooting	2
6.	Mental Preparation and Focus	2
7.	Practice and learning session of live shooting( rifle)	2
8.	Learning about pistol shooting( pistol)	2
9.	Introduction of pistol positions and dry practice	2
10.	Practical Shooting Drills (basic)	2
11.	Learning about live shooting and technics( standing position)	2
12.	Learning of Concentration, breathing and relaxing exercise for shooting	2
13.	Introduction of competition level and practice	2
14.	Final test and oral ( rifle and pistol match)	2
<b>TOTAL</b>		<b>28</b>

**Reference Books:**

1. David Watson, “ABCs of Rifle Shooting”, Gun Digest (Imprint of KP Books), 2014

**E-Resources:**

1. Introduction to Exercise Physiology & Sports Performance, IIT Madras, <https://nptel.ac.in/courses/109106406>



## DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)					<b>Semester:</b> I				
<b>Course:</b> Liberal Learning – I (Volleyball)					<b>Code:</b> 25ECCC102I				
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25

**Prerequisites:**

Proper health, Basic knowledge of rules of the game.

**Course Objectives:**

1. Develop foundational volleyball skills, including serving, passing, setting, spiking, and blocking, while mastering game rules and strategies through practical gameplay and scrimmage.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Demonstrate proficiency in basic volleyball skills such as serving, passing, setting, spiking, and blocking.
<b>CO2</b>	Apply offensive and defensive strategies effectively, including serve receive and transition play, during gameplay.
<b>CO3</b>	Understand and implement volleyball rules and referee gestures, applying them accurately during practical gameplay and scrimmages.

**Course Contents:**

Sr. No.	Description	Duration (Hrs.)
1.	Introduction to Volleyball	2
2.	Basic Skills - Serving	2
3.	Basic Skills- Passing	2
4.	Basic Skills- Setting	2
5.	Spiking Basics	2
6.	Blocking Basics	2
7.	Digging Basics	2
8.	Serve Receive	2
9.	Offensive Strategies	2
10.	Defensive Strategies	2
11.	Transition Play	2
12.	Gameplay & Scrimmage	2
13.	Game Rules , Refree Gestures	2
14.	Practical	2
<b>TOTAL</b>		<b>28</b>

**Text Books:**

1. Jitendra Kumar, "The Complete Guide to Volleyball", Blue Rose Publisher

**Reference Books:**

1. N. Ramachandran, "Volleyball: Steps to Success", Sports Publication

**E-Resources:**

1. <https://coachtube.com/course/volleyball/volleyball-for-beginners/7004>

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<b>Program:</b> B. Tech. (Electronics and Computer Engineering)				<b>Semester: I</b>					
<b>Course:</b> Liberal Learning – I (Football)				<b>Code:</b> 25ECCC102J					
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25

**Prerequisites:**

Proper health, Basic knowledge of rules of the game.

**Course Objectives:**

1. To enhance players' technical skills, tactical understanding, physical fitness, teamwork, and sportsmanship, fostering a comprehensive understanding and appreciation of the game.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	To identify and describe the fundamental skills and strategies involved in football, including ball control, dribbling techniques, basic offensive and defensive tactics.
<b>CO2</b>	To apply advanced dribbling and passing techniques during practice sessions.
<b>CO3</b>	To design and execute a cohesive game plan that integrates set pieces, team chemistry, and communication, evaluating its effectiveness through simulation matches.

**Course Contents:**

Sr. No.	Description	Duration (Hrs.)
1.	Introduction and Basic Skills.	2
2.	Ball Control and Movement.	2
3.	Advanced Dribbling and Passing.	2
4.	Shooting and Finishing.	2
5.	Offensive Tactics.	2
6.	Defensive Tactics.	2
7.	Set Pieces (Offensive and Defensive).	2
8.	Team Chemistry and Communication.	2
9.	Midfield Dominance.	2
10.	Forward Play and Creativity.	2
11.	Defense Organization.	2
12.	Goalkeeper Training.	2
13.	Speed and Agility.	2
14.	Simulation Matches.	2
<b>TOTAL</b>		<b>28</b>

**Text Books:**

1. Srinivasan J. B, "Football Coaching: A Comprehensive Guide", Sports Publishing.

**Reference Books:**

1. Rob Ellis, "The Complete Guide to Coaching Soccer", Meyer & Meyer Sport.

**E-Resources:**

1. Udemy – Soccer Courses - <https://www.udemy.com/topic/soccer/>

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)	<b>Semester: I</b>								
<b>Course:</b> Indian Knowledge System and Financial Literacy	<b>Code:</b> 25ECIK101								
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	-	-	50

**Prerequisites:**

Basic knowledge of algebra and mathematical operations.

**Course Objectives:**

1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the importance of roots of Indian Knowledge System.
2. To make students proficient in fundamental financial concepts essential for managing personal finances effectively.
3. To equip students with practical budgeting skills to empower them to achieve financial independence.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Understand IKS fundamentals, Indian numeral system, and key contributions in mathematics and measurement.
<b>CO2</b>	Recognize metal working techniques, Vastushastra principles, historical engineering and architecture practices.
<b>CO3</b>	Understand financial concepts, money types, bank accounts, and essential financial terms for practical application.
<b>CO4</b>	Manage budgets, credit, loans, and develop financial plans for career and education goals.
<b>CO5</b>	Understand various investments, risk management, insurance types, and develop retirement planning strategies.
<b>CO6</b>	Comprehend tax forms, compliance, fraud protection, and financial considerations for investments and business.

**Course Contents:**

Unit	Description	Duration (Hrs.)
1.	<p><b>Foundations of Indian Knowledge System:</b> Definition and scope of IKS, Historical development and significance.</p> <p><b>Number System and Units for Measurement:</b> Salient features of the Indian numeral system, The discovery of zero and its importance, Decimal Systems, Measurement of time, distance and weight.</p> <p><b>Mathematics:</b> Unique aspects of Indian mathematics, Great mathematicians and their significant contributions in the area of arithmetic, algebra, geometry, trigonometry, binary mathematics.</p>	5
2.	<p><b>Application of Indian Knowledge System:</b> Metals and Metal Working: Mining and ore extraction, Extraction of iron from Biotite by indigenous techniques, Lost wax casting of idols and artefacts, Architecture and Structures: Vastushastra, Unitary buildings and Town planning, Temple architecture. Physical structures in India, Irrigation and water management</p>	5

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3.	<b>Finance:</b> Importance of Financial Literacy for Engineers, Understanding Money, Types of Money- Cash, Cheque, UPI Payment, Digital Currency, etc Types of bank accounts - saving, salary, current, loan, etc., Basic financial Terms- Income, Expenditure, Balance, saving, loan, interest rates, compound interest rate, credit, Investment, Taxes	4
4.	<b>Financial Planning:</b> Personal budgeting, Understanding debit and credit card, credit score, Types of credit card, credit card payment cycle, Barrowing, Loans / Debts, Types of loans, Terms of barrowing, Loan, Interest rate, Principal, EMI, EMI Calculation, Repayment of loan/debt strategy, Financial Planning for Career Development, Higher studies,	5
5.	<b>Investment and Wealth Management:</b> Basics of Investing, Effect of compounding, Types of Investment (fixed deposit, recurring deposits, Insurance policies, Bonds, Mutual Funds, Stocks, real estate, etc.) Risk and Return, Concept of SIP, STP and SWP, Stock Market, Stock Exchanges, reading of stock market indices, Life insurance, healthcare insurance, vehicle insurance, Importance of early retirement planning, Investment strategy, Pension Plan, Portfolio management,	5
6.	<b>Finance Compliance:</b> Types of Taxes, Types of Income Tax return form and Filling, Taxes and reforms, Impact of taxation policy on Investment, Scams and Frauds, Protection of personal information, Financial consideration for starting business, Real estate and purchase	4
<b>TOTAL</b>		<b>28</b>

**Text Books:**

1. B. Mahadevan, Vinayak Rajat Bhat, Nagendra Pawana R. N., "Introduction to Indian Knowledge System – Concepts and Applications", PHI Learning Pvt. Ltd., New Delhi.
2. Dr. Babu V., Mr. Mohammed Umair, "Financial Literacy", Himalaya Publishing House, First Edition.

**Reference Books:**

1. A. K. Bag, "History of Technology in India", Vol. I, Indian National Science Academy, New Delhi.
2. Dr. S. Gurusamy, "Indian Financial System", Tata McGraw-Hill Education Pvt. Ltd 2<sup>nd</sup> Edition.
3. D.N. Bose, S.N. Sen and B. V. Subbarayappa, "A Concise History of Science in India", Indian National Science Academy, New Delhi.

**E-Resources:**

1. SWAYAM - "Indian Knowledge System(IKS): Concepts and Applications in Engineering", Indian Institute of Management Bangalore (IIMB), Chanakya University, Bangalore. [https://onlinecourses.swayam2.ac.in/imb23\\_mg53/preview](https://onlinecourses.swayam2.ac.in/imb23_mg53/preview)
2. SWAYAM - "Introduction to Banking and Financial Markets", Indian Institute of Management Bangalore (IIMB), - [https://onlinecourses.swayam2.ac.in/imb23\\_mg14/preview](https://onlinecourses.swayam2.ac.in/imb23_mg14/preview)
3. Online free course on "Financial Literacy" by Khan Academy. <https://www.khanacademy.org/college-careers-more/financial-literacy/xa6995ea67a8e9fdd:welcome-to-financial-literacy>



**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

# **SYLLABUS**

## **SEMESTER - II**



## DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)					<b>Semester:</b> II				
<b>Course:</b> Engineering Mathematics - II					<b>Code:</b> 25ECBS203				
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
03	-	-	03	40	60	-	-	-	100

### Prerequisites:

Basic concept of Differentiation, Integration and Vector.

### Course Objectives:

1. To introduce student some methods to find the solution of first order & first degree ordinary differential equations with its applications.
2. To make students familiar with vector differentiation.
3. To acquaint the student with mathematical tools needed in evaluating improper integrals, multiple integrals and their usage.

### Course Outcomes:

After completion of this course, students will be able to -

<b>CO1</b>	Solve first order ordinary differential equation.
<b>CO2</b>	Apply differential equation in engineering applications.
<b>CO3</b>	Determine the velocity vector, gradient, divergence, curl.
<b>CO4</b>	Evaluate improper integrals.
<b>CO5</b>	Demonstrate multiple integrals for regions in the plane.
<b>CO6</b>	Use of multiple integrals to find area bounded by curves & volume bounded by surfaces.

### Course Contents:

Unit	Description	Duration (Hrs.)
1.	<b>First Order Ordinary Differential Equation:</b> Exact differential equations, Equations reducible to exact form. Linear differential equations, Equations reducible to linear form and Bernoulli's equation.	7
2.	<b>Applications of Differential Equations:</b> Applications of differential equations to orthogonal trajectories, Newton's law of cooling, Kirchhoff's law of electrical circuits, Rectilinear motion, Simple harmonic motion, One dimensional conduction of heat.	7
3.	<b>Vector Differential Calculus:</b> Velocity vector, acceleration vector, tangential and normal component of acceleration, Vector differential operator, gradient, directional derivatives, angle between surfaces, Divergence and curl, solenoidal and irrotational field	7
4.	<b>Integral Calculus:</b> Reduction formulae, Beta and Gamma functions, Differentiation under integral sign and Error functions.	7
5.	<b>Multiple Integrals:</b> Double integration in Cartesian & polar coordinates, Change of order of integration, Triple integral in Cartesian & polar coordinates.	7
6.	<b>Applications of Multiple Integral:</b> Applications to find Area, Volume, Mass, Centre of gravity and Moment of inertia.	7
<b>TOTAL</b>		<b>42</b>



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### Text Books:

1. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill.
2. B. S. Grewal , "Higher Engineering Mathematics" , Khanna Publication
3. H.K.Dass, "Higher Engineering Mathematics", S.Chand Publication
4. C.Ray Wylie &L.Barrett, "Advanced Engineering Mathematics" , McGraw Hill Publications.

### Reference Books:

1. Erwin Kreyszig , "Advanced Engineering Mathematics" , Wiley Eastern Ltd.
2. M. D. Greenberg , "Advanced Engineering Mathematics" , Pearson Education
3. Peter V. O'Neil , "Advanced Engineering Mathematics" , Thomson Learning
4. P. N. Wartikar and J. N. Wartikar , "Applied Mathematics (Vol. I & Vol. II)" , Vidyarthi Griha Prakashan, Pune.
5. Ron Larson and David C. Falvo, "Elementary Linear Algebra" , Houghton Mifflin Harcourt Publishing Company

### E-Resources:

1. A NPTEL Course on "Engineering Mathematics-II" IIT Khargpur -  
<https://www.youtube.com/playlist?list=PLbRMhDVUMngeVrxtbBz-n8HvP8KAWBpI5>
2. Applications of Differential Equations | Orthogonal Trajectories -  
<https://www.youtube.com/watch?v=Ziu0y2kWTCM&list=PLT3bOBUU3L9juyFTI3lpeXXhIetVB00cr>
3. Applications of Differential Equations| Newton's law of Cooling -  
[https://www.youtube.com/watch?v=gJSvcf9\\_Duc](https://www.youtube.com/watch?v=gJSvcf9_Duc)
4. Dr.GajendraPurohit, "Gradient of a Scalar Field & Directional Derivative | Normal Vector" -  
[https://www.youtube.com/watch?v=9CHfHuFBTw8&list=PLU6SqdYcYsfJz9FAzbgoIjlkw4N\\_XAar-&index=2](https://www.youtube.com/watch?v=9CHfHuFBTw8&list=PLU6SqdYcYsfJz9FAzbgoIjlkw4N_XAar-&index=2)
5. Dr.GajendraPurohit, "Double Integral & Area By Double Integration | Multiple Integral" -  
[https://www.youtube.com/watch?v=db7d\\_a0wiUg&list=PLU6SqdYcYsfLoKyzF\\_dwxAQf8Ii6VC54](https://www.youtube.com/watch?v=db7d_a0wiUg&list=PLU6SqdYcYsfLoKyzF_dwxAQf8Ii6VC54)
6. Double Integration - Change of Order of Integration | Cartesian & Polar -  
[https://www.youtube.com/watch?v=fXMyLYwBB3s&list=PLU6SqdYcYsfLoKyzF\\_dwxAQf8Ii6VC54&index=4](https://www.youtube.com/watch?v=fXMyLYwBB3s&list=PLU6SqdYcYsfLoKyzF_dwxAQf8Ii6VC54&index=4)



## DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)					<b>Semester:</b> II				
<b>Course:</b> Engineering Chemistry					<b>Code:</b> 25ECBS204				
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	02	-	03	40	60	25	-	-	125

**Prerequisites:**

Basic knowledge of volumetric analysis, structure property relationship, classification and properties of polymers, electromagnetic radiation, electrochemical series.

**Course Objectives:**

1. To familiarize the students with the basic phenomenon/concepts of chemistry and its applications in various fields of Engineering.
2. To impart knowledge of technologies involved in water analysis to improve water quality.
3. To learn significance science of corrosion and preventive methods used for minimizing corrosion.
4. To understand structure, properties and applications of speciality polymers and nanomaterials.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Analyze water softening parameters.
<b>CO2</b>	Utilize different analytical methods for analysis of various chemical compounds.
<b>CO3</b>	Understand the mechanism of destruction of metals (corrosion) and effective preventive measures.
<b>CO4</b>	Explore the knowledge of advanced engineering materials for various engineering applications.
<b>CO5</b>	Analyze fuel and suggest use of alternative fuels.
<b>CO6</b>	Familiarize with classification, properties and applications of nanomaterials.

**Course Contents:**

Unit	Description	Duration (Hrs.)
1.	<b>Water Technology:</b> Introduction, Chemical Analysis of Water- Hardness; Temporary and Permanent, Alkalinity (Hydroxide, Carbonate and Bicarbonate), Softening Methods: Zeolite and Demineralization Process, Water Purification: Reverse Osmosis. Simple Numerical on Hardness Determination and Alkalinity Calculation.	5
2.	<b>Instrumental Methods of Analysis:</b> Types of analysis: Quantitative and Qualitative analysis Introduction, Instrumentation and Applications of following methods: Colorimetry, pHmetry (Titration of Strong acid versus Strong base), Conductometry (Titration of Strong acid versus Strong base )	5
3.	<b>Corrosion Science:</b> Introduction, Types of Corrosion-Dry and Wet corrosion, Wet Corrosion Mechanism: Hydrogen Evolution and Oxygen Absorption, Factors affecting rate of corrosion. Methods of prevention of corrosion: Cathodic Protection (Sacrificial Anode), Anodic Protection (Anodizing), Methods to apply Metallic Coatings-Hot dipping, Electroplating.	4



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<p><b>Engineering Polymers:</b>            Polymers: Introduction, Definition of Polymer, Monomer and Functionality of monomers            Speciality Polymers: Introduction, Preparation, Properties and Applications of the following polymers:            1. Engineering Thermoplastic: Polycarbonate            2. Conducting Polymer: Polyacetylene            Polymer Composites: Introduction, Constituents of composite, Advantages over conventional materials, Applications, Fiber Reinforced Plastic (FRP)-Glass reinforced and Carbon reinforced.</p>	4. 5	5
<p><b>Fuels and Combustion:</b>            Introduction, Calorific value - Definition, Gross and Net calorific value, Determination of Calorific value: Principle, Construction and Working of Bomb Calorimeter (Simple Numerical), Solid fuel: Coal: Analysis of Coal-Proximate (Simple Numerical).            Alternate fuels: Biodiesel and Power alcohol.            Hydrogen as future fuel: Production, Advantages, Storage and Applications in Hydrogen fuel cell.</p>	5	5
<p><b>Nanomaterials:</b>            Introduction, Classification of Nanomaterials Based on Dimensions, Nanoscale materials: Structure, Properties and Applications of Graphene and Quantum dots (semiconductor nanoparticles), Importance of Nanotechnology in engineering applications.</p>	6.	4
<b>TOTAL</b>		<b>28</b>

### **List of Experiments:**

#### **A. Lab Experiments (Any Seven)**

1. Determination of hardness of water by EDTA method.
2. Determination of alkalinity of water.
3. Determination of strength of strong acid using pH meter.
4. Determination of maximum wavelength of absorption of  $\text{CuSO}_4/\text{FeSO}_4/\text{KMnO}_4$ , verify Beer's law and find unknown concentration of given sample.
5. Titration of a mixture of strong acid with strong base using Conductometer.
6. Preparation of phenol-formaldehyde/urea-formaldehyde resin.
7. Proximate analysis of coal.
8. Coating of copper or zinc on iron plate using electroplating.
9. Determination of the molecular weight of a polymer by using Ostwald's Viscometer.

#### **B. Demonstration (virtual) (Any One)**

10. Demonstration of effect of environmental conditions on metal by weight loss method.
11. Synthesis of oxide nanoparticles.

### **Text Books:**

1. O.G. Palanna, "Engineering Chemistry", Tata McGraw Hill Education Pvt. Ltd.
2. Dara S. S., Umare S. A., "Textbook of Engineering Chemistry", 12<sup>th</sup> Ed, S. Chand & Com Ltd.
3. Jain and Jain, "Engineering Chemistry", 16<sup>th</sup> Ed, Dhanpat Rai and Co. (Pvt.) Ltd., Delhi.



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### Reference Books:

1. G. R. Chatwal & S. K. Anand, "Instrumental Methods of Chemical Analysis", Himalaya Publishing House.
2. Dr. Sunita Rattan; A Textbook of Engineering Chemistry; 3<sup>rd</sup> Ed, S. K. Kataria & Sons, New Delhi
3. V. R. Gowarikar, N. V. Viswanathan, Jayadev Sreedhar, "Polymer Science", Wiley Eastern Limited.
4. Billmeyer F. W., "Textbook of polymer science", John Wiley and Sons.
5. B. Sivasankar, "Engineering Chemistry", Tata McGraw-Hill Education Publishing company Limited.
6. G. L. Hornyak, J. J. Moone, H. F. Tihhale, J. Dutta "Fundamentals of Nanotechnology", CRC press.

### E-Resources:

#### MOOC / NPTEL/YouTube Links:

1. NPTEL Course on Corrosion, IISc Bangalore : <http://nptel.ac.in/courses/113108051/>
2. NPTEL Course on Polymer, IIT Kharagpur: <http://nptel.ac.in/courses/104105039/>, <http://nptel.ac.in/courses/104103071/40>
3. NPTEL Course on Water Technology, IIT Kanpur: <http://nptel.ac.in/courses/105104102/>
4. NPTEL Course on UV-Visible Spectroscopy: <http://nptel.ac.in/courses/102103044/4>
5. NPTEL Course on Energy Sources: <http://nptel.ac.in/courses/103105110/4>
6. NPTEL Course on "Engineering Chemistry-I", <https://nptel.ac.in/courses/122/106/122106028/>
7. NPTEL Course on "Fundamentals of Spectroscopy", NCL, IISER Pune <https://nptel.ac.in/courses/104/106/104106122/>

### Virtual Labs:

1. PICT Pune: <http://chemistryvl.pict.edu/#/>
2. NITK Surathkal: Hardness of water: <https://ee1-nitk.vlabs.ac.in/exp/determination-of-hardness/simulation.html#/>
3. NITK Surathkal: Alkalinity of water: <https://ee1-nitk.vlabs.ac.in/exp/determination-of-alkalinity/simulation.html>
4. IIT Hyderabad: Colorimeter, verification of Beer's law, <https://mas-iiith.vlabs.ac.in/exp/beer-law/simulation.html>
5. IIT Kanpur: Preparation of phenol-formaldehyde resin, <http://ebootathon.com/labs/beta/chemistry/EngineeringChemistryLab/exp1/simulation.html>
6. Amrita University: Determination of viscosity average molecular weight polymer, [https://pcv-au.vlabs.ac.in/physicalchemistry/Determination\\_of\\_ViscosityAverageMolecularWeightofPolymer/](https://pcv-au.vlabs.ac.in/physicalchemistry/Determination_of_ViscosityAverageMolecularWeightofPolymer/)

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)	<b>Semester:</b> II
<b>Course:</b> Basic Electrical Engineering	<b>Code:</b> 25ECES203
<b>Teaching Scheme (Hrs/week)</b>	<b>Evaluation Scheme (Marks)</b>
<b>Lecture</b> <b>Practical</b> <b>Tutorial</b> <b>Credit</b>	<b>CIE</b> <b>ETE</b> <b>TW</b> <b>OR</b> <b>PR</b> <b>Total</b>

**Prerequisites:**

Fundamental Electrical Concepts, Familiarity with Electrical Units &amp; basic safety precautions.

**Course Objectives:**

1. To familiarize students with the fundamentals of Electrical Engineering.
2. To make students aware about the functioning of electrical machines, batteries and their applications.
3. To introduce students to the components of low-voltage electrical installations and the methodology for estimating energy bills.

**Course Outcomes:** After completion of this course, students will able to -

<b>CO1</b>	Understand work, power, and energy relationships, unit conversions, and Lead Acid and Lithium-Ion battery charging/discharging processes.
<b>CO2</b>	Analyze simple resistive circuit powered by DC supply using circuit theorems.
<b>CO3</b>	Interpret voltage, current, phase relationship for RLC loads.
<b>CO4</b>	Examine voltage, current and power relationships in star and delta AC circuits, including protection systems.
<b>CO5</b>	Explain operational principle of transformer, DC machines and induction motor.
<b>CO6</b>	Estimate the energy bill for domestic consumers.

**Course Contents:**

<b>Unit</b>	<b>Description</b>	<b>Duration (Hrs.)</b>
1.	<p><b>Work, Power and Energy and Batteries:</b></p> <p><b>Basic Definition and Units:</b> Length, Mass, Time, Temperature, Area, Volume, Acceleration, Density, Velocity, Pressure, Work, Energy, Torque, Power, Voltage, Current, Resistance, Capacitance, Conductance, Charge, Inductance, Frequency, Impedance etc., Multiples and Submultiples, Types of units (MKS, CGS and SI), Unit conversions.</p> <p><b>Work, Power and Energy:</b> Effect of temperature on resistance, resistance temperature coefficient (derivation and numerical), insulation resistance of single core cable (derivation and numerical), conversion of energy from one form to another in electrical, mechanical, and thermal systems.</p> <p><b>Batteries:</b> Lead acid and Lithium Ion battery – (Construction, working, charging and discharging and its applications), concept of depth of charging, state of charge of battery, battery capacity, battery efficiency, ampere-hour and watt-hour of battery, maintenance of batteries, and series-parallel connection of batteries.</p>	7
2.	<p><b>DC Circuits:</b></p> <p>Analysis of series and parallel circuits, KVL and KCL (statement, sign convention), ideal and practical voltage and current sources, simple mesh and node analysis, source transformation (simple numerical), star-delta transformation (simple</p>	7

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	numerical), Superposition and Thevenin's theorem (Statement and numerical - only for independent sources, and resistive circuit).	
3.	<b>AC Circuits (Single phase circuits):</b> Generation of sinusoidal voltage, representation of sinusoidal waveforms, concept of cycle, period, frequency, instantaneous, peak, average, and RMS values, Lagging, leading and in phase quantities and their phasor representation, Rectangular and polar representation of phasors, Concept of real, reactive, apparent, complex power and power factor, Analysis of single-phase AC series circuit (pure R, L, C and series R-L, R-C, and R-L-C combinations), Concept of impedance, admittance, voltage-current, power waveforms and relevant phasor diagrams for different combinations.	7
4.	<b>AC Circuits (Three-phase circuit) and Electrical Installations:</b> <b>AC Circuits (Three-phase circuit):</b> Concept of three-phase supply and phase sequence, Three-phase balanced circuits, voltage and current relations in star and delta connections, and power calculations. <b>Electrical Installations:</b> Components of LT Switchgear: Fuse, MCB, MCCB (working, advantages, disadvantages and applications), Earthing - (Definition, importance of earthing, types, advantages of earthing, difference between earthing and neutral).	7
5.	<b>Single Phase Transformer:</b> Construction, working principle and EMF equation of transformer, Ideal and practical transformer, Losses, Types of transformers (Step up and step-down transformer), Concept of voltage regulation and efficiency (simple numerical), Introduction to auto-transformer (Construction, working, advantages and applications). <b>Electricity Bill:</b> Power rating of household appliances, Definition of “unit” used for consumption of electrical energy, Two-part electricity tariff, Calculation of electricity bill for domestic consumers.	7
6.	<b>DC Machines:</b> DC generator and motor (Construction, working principle, types, and applications), emf equation of DC generator, (Simple numerical). Voltage expression of generator and motor (Simple numerical), Concept of back-emf (simple numerical), Armature and shaft torque equation (only descriptive treatment). <b>AC Machines:</b> Constructional features, working principle of three-phase induction motor, types (squirrel cage and slip ring), concept of synchronous speed, rotor speed, slip, power stages in three phase induction motor, concept of torque equation of three phase induction motor, torque-slip characteristics, industrial applications of induction motor.	7
<b>TOTAL</b>		<b>42</b>
<b>List of Experiments:</b>		
<b>Group A: Minimum SIX experiments from following list</b>		
<ol style="list-style-type: none"> <li>1. Demonstration of measurement of various units and their conversions.</li> <li>2. Measurement of insulation resistance of electrical equipment/cable using Megger.</li> <li>3. Verification of Superposition theorem with DC supply using hardware.</li> <li>4. Verification of Thevenin's theorem with DC supply using hardware.</li> <li>5. Measurement of steady state response of series RL and RC circuits on AC supply and observations of voltage and current waveforms on storage oscilloscope.</li> <li>6. Verification of relation between phase and line quantities in three-phase balanced star and delta connections of load.</li> </ol>		



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7. Demonstration of different types of electrical protection equipment such as fuses, MCB, MCCB and earthing system.
8. Calculation of efficiency and voltage regulation of single-phase transformer by direct loading test.
9. Demonstration of cut-out sections of machines: DC machine (commutator-brush arrangement), Induction machine (squirrel cage rotor).
10. Analysis of LT electricity bills and energy conservation (Case study).

**Group B: DIY Models – Any TWO, from following list or any other suitable model**

11. Demonstration of fundamental laws of Electrical Engineering using breadboard – (a) Ohm's Law (b) Faraday's law of Electromagnetic Induction (c) Kirchhoff's laws (KCL and KVL).
12. Generation of power with magnets and copper wire.
13. Conversion of mechanical energy to electrical energy and vice versa.
14. Model of mutual induction in transformer.

**Group C: A mandatory visit to any transformer/electrical machines manufacturing industry.**

**Text Books:**

1. B.L. Theraja, A. K. Theraja, "A Textbook of Electrical Technology" - Volume I: Basic Electrical Engineering", S. Chand Publication.
2. V. K. Mehta, Rohit Mehta, "Basic Electrical Engineering", S. Chand and Company Private Ltd.
3. D. P. Kothari, I.J. Nagrath, "Theory and Problems of Basic Electrical Engineering", PHI Publication.
4. Bharti Dwivedi, Anurag Tripathi, "Fundamental of Electrical Engineering", Wiley Publication.

**Reference Books:**

1. E. Hughes, "Electrical and Electronics Technology", Pearson Publication.
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.
3. H Cotton, "Electrical technology", CBS Publications.
4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

**E-Resources:**

1. A NPTEL Course on "Fundamentals of Electrical Engineering", IIT Khargpur - <https://archive.nptel.ac.in/courses/108/105/108105112/>
2. A NPTEL Course on "Basic Electrical Technology", IISc Bangalore - <https://archive.nptel.ac.in/courses/108/108/108108076/>
3. Virtual lab – Amrita Vishwa Vidyapeetham - <https://ylab.amrita.edu/?sub=1&brch=75>
4. Electrical Engineering Basics - <https://www.classcentral.com/classroom/youtube-electrical-engineering-basics-54532>

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<b>Program:</b> B. Tech. (Electronics and Computer Engineering)					<b>Semester:</b> II				
<b>Course:</b> Fundamentals of Computer Systems and Networking					<b>Code:</b> 25ECES204				
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	02	-	03	40	60	25	-	-	125

**Prerequisites:**

Basic knowledge of computers and binary systems.

**Course Objectives:**

1. To understand the architecture and functioning of computer systems.
2. To explore fundamental networking concepts and technologies.
3. To develop foundational knowledge of operating systems and computer organization.
4. To learn about various networking models, protocols, and data communication methods.
5. To understand the role of hardware and software in computing and networking.

**Course Outcomes:** After completion of this course, students will able to -

<b>CO1</b>	Understand the basic components and organization of a computer system and the role of operating systems in managing hardware and software.
<b>CO2</b>	Gain insights into the organization and architecture of a computer, including CPU functioning and memory hierarchy.
<b>CO3</b>	Understand basic networking concepts, data communication modes, network topologies, and the types of networks.
<b>CO4</b>	Describe the OSI and TCP/IP models, along with understanding key networking protocols and addressing techniques.
<b>CO5</b>	Understand the basic concepts of network security, including encryption, firewalls, and security protocols to protect communication.
<b>CO6</b>	Explore the emerging trends in computer systems and networking, including cloud computing, IoT, and advancements in network technologies

**Course Contents:**

Unit	Description	Duration (Hrs.)
1.	<p><b>Introduction to Computer Systems:</b>            Overview of Computers: History of computers (evolution and key milestones),            Types of computers: Analog, Digital, And Hybrid.            Applications of Computers: In education, healthcare, business, entertainment, and other fields.</p> <p>Components of a Computer System: Hardware vs. Software, Basic hardware components (CPU, memory, storage, input/output devices).            Basic Organization of a Computer: CPU (Control Unit, Arithmetic Logic Unit, Registers), Memory hierarchy (Primary, Secondary, Cache, Virtual).            Data Representation: Number systems (Binary, Octal, Decimal, Hexadecimal),            Binary arithmetic (addition, subtraction, multiplication, division), Character representation (ASCII, Unicode).</p>	4



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	Introduction to Operating Systems: Functions (process, memory, file system, device management), Types (batch, time-sharing, real-time, distributed, embedded), Structure (Kernel, Shell, System Utilities).	
2.	<p><b>Computer Architecture and Organization:</b></p> <p>Basic Structure of a Computer: Von Neumann architecture, instruction cycle.</p> <p>CPU Organization: ALU, Registers, Control Unit.</p> <p>Buses and Interfacing: Overview of data transfer methods (bus organization, control lines).</p> <p>Memory Architecture: RAM, ROM, Cache, Virtual Memory.</p> <p>I/O Systems: I/O devices, I/O addressing, and basic concepts of interrupts and DMA.</p> <p>Introduction to Graphics Processing Unit (GPU): Understand the functionalities of a GPU in graphics processing and video acceleration.</p> <p>Display Technologies: Explore different display types (CRT, LCD, LED), display technology fundamentals, resolution, and refresh rate</p>	4
3.	<p><b>Data Communication and Networking Fundamentals:</b></p> <p>Data Communication: Types of data transmission, Modes (Simplex, Half-duplex, Full-duplex), Transmission media (Wired, Wireless)</p> <p>Network Topologies: Bus, Star, Ring, Mesh, Hybrid.</p> <p>Types of Networks: LAN, WAN, MAN, PAN</p> <p>Overview of Networking Devices: Switches, Routers, Modems, Hubs, Repeaters</p> <p>Introduction to the Internet: Basics of how the internet works, Internet protocols</p>	5
4.	<p><b>Networking Models and Protocols:</b></p> <p>OSI Model: Layers and functions.</p> <p>TCP/IP Model: Layers and comparison with OSI.</p> <p>IP Addressing: IPv4, IPv6, Subnetting, CIDR.</p> <p>Network Protocols: HTTP, FTP, SMTP, DNS, DHCP, ICMP.</p> <p>Packet Switching vs. Circuit Switching: Fundamental differences and use cases.</p>	5
5.	<p><b>Introduction to Network Security:</b></p> <p>Fundamentals of Network Security: Threats, Attacks, Vulnerabilities.</p> <p>Cryptography Basics: Symmetric and Asymmetric Encryption, hashing.</p> <p>Firewalls and Intrusion Detection Systems (IDS): Working principles of firewalls and intrusion detection systems.</p> <p>Security Protocols: SSL/TLS, IPSec, VPN.</p> <p>Authentication and Access Control: Overview of methods such as passwords, biometrics, multi-factor authentication.</p>	5
6.	<p><b>Emerging Trends in Computer Systems and Networking:</b></p> <p>Cloud Computing: Basics, service models (IaaS, PaaS, SaaS), deployment models (public, private, hybrid).</p> <p>Virtualization: Concept of virtual machines, hypervisors.</p> <p>Internet of Things (IoT): Architecture, Applications, Challenges.</p> <p>5G Networking: Features, use cases, and its role in modern communications.</p> <p>Edge and Fog Computing: Concepts and Applications.</p> <p>Data Centers: Fundamentals, architectures, and their role in modern computing</p>	5
<b>TOTAL</b>		<b>28</b>



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### List of Experiments:

#### Group A: Fundamentals of Computer Systems: (Any 8)

1. Disassemble and identify key components of a computer system (CPU, RAM, motherboard, storage, etc.). Discuss functionalities and basic maintenance practices.
2. Use a simulator to demonstrate the instruction execution process in a CPU and explore the memory hierarchy (RAM, cache, virtual memory). **Open-source software:** SimulIDE, Little Man Computer Simulator.
3. Create a diagram of a motherboard, labeling key components (CPU socket, RAM slots, expansion slots, connectors) and explaining their functions. **Open-source software:** Dia, Fritzing.
4. Install and configure an expansion card (e.g., graphics card or network card) in a computer.
5. Compare HDD and SSD by conducting performance tests (e.g., read/write speed tests). **Open-source software:** CrystalDiskMark, KDiskMark (Linux)
6. Install an operating system (e.g., Windows, Linux) on a computer. **Open-source software:** Ubuntu, Fedora.
7. Benchmark a GPU using a graphics-intensive application and analyze its performance. **Open-source software:** Unigine Heaven Benchmark, GLMark2
8. Compare different display technologies (CRT, LCD, LED) in terms of resolution, refresh rate, and overall quality.
9. Diagnose and resolve a hardware or software problem in a computer system. **Open-source software:** HWiNFO, Speccy
10. Install and configure antivirus software, demonstrating its features. **Open-source software:** ClamAV.

#### Group B: Fundamentals of Networking: (Any 5)

1. Set up a small LAN and demonstrate data transfer between devices. **Open-source software:** Wireshark, EtherApe
2. Configure a switch and a router for a network, demonstrating their roles in data communication. **Open-source software:** Cisco Packet Tracer, GNS3
3. Simulate data transfer using the TCP/IP model and analyze packet data. **Open-source software:** Wireshark
4. Create a presentation on common malware and viruses, including preventive measures and real-world examples.
5. Research and create a report on different data center topologies and architectures (e.g., star, mesh, tree).
6. Conduct a case study of a specific data center or take a virtual tour of a data center, highlighting key components and their functions.

### Text Books:

1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface," Morgan Kaufmann, 2017.
2. Behrouz A. Forouzan, "Data Communications and Networking," McGraw-Hill, 2017.
3. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach," Pearson, 2020.
4. William Stallings, "Cryptography and Network Security: Principles and Practice," Pearson, 2017.



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5. Thomas Erl, "Cloud Computing: Concepts, Technology & Architecture," Prentice Hall, 2013.

### Reference Books:

1. Andrew S. Tanenbaum, "Modern Operating Systems," Pearson, 2015.
2. M. Morris Mano, "Computer System Architecture," Pearson, 2013.
3. Douglas E. Comer, "Internetworking with TCP/IP," Pearson, 2018.
4. Jerome H. Saltzer and M. Frans Kaashoek, "Principles of Computer System Design: An Introduction," Morgan Kaufmann, 2009.

### E-Resources:

1. <https://nptel.ac.in/courses/106103068>
2. <https://nptel.ac.in/courses/106105081>
3. <https://nptel.ac.in/courses/106104449>



**Zeal Education Society's**  
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<b>Program:</b> B. Tech. (Electronics and Computer Engineering)					<b>Semester:</b> II				
<b>Course:</b> Fundamental of Operating System					<b>Code:</b> 25ECPC201				
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	40	60	-	-	-	100

**Prerequisites:**

Fundamentals of Computer Hardware and Software

**Course Objectives:**

1. To understand the major components of an Operating System and its functions.
2. To introduce the concept of a process and its management, including transitions and scheduling.
3. To understand basic concepts related to Inter-Process Communication (IPC), such as mutual exclusion and deadlocks, and the role of an Operating System in IPC.
4. To understand the concepts and implementation of memory management policies and virtual memory.
5. To understand the functions of an Operating System in storage management and device management.
6. To study the need for and fundamentals of special-purpose operating systems in light of emerging technologies.

**Course Outcomes:**

<b>CO1</b>	Understand the basic concepts and functions of Operating Systems.
<b>CO2</b>	Describe process management policies and illustrate CPU scheduling of processes.
<b>CO3</b>	Explain and apply synchronization primitives and evaluate how Operating Systems handle deadlock conditions.
<b>CO4</b>	Describe and analyze memory allocation and management functions of Operating Systems.
<b>CO5</b>	Analyze and evaluate the storage management services provided by Operating Systems.
<b>CO6</b>	Compare the functions of various special-purpose Operating Systems.

**Course Contents:**

Unit	Description	Duration (Hrs.)
1.	<p><b>Introduction to Operating Systems</b>  <b>History and Evolution:</b> Major milestones and development of operating systems, Influential operating systems (UNIX, Windows, Linux, etc.), Operating System Structure and Operations.</p> <p>Functions of Operating Systems, Operating System Services and Interfaces System Calls and Their Types, System Programs, Operating System Structure, System Boot. <b>Comparative Study of Different Operating Systems</b>-System Calls with Examples for Different Operating Systems, Windows 9x, Unix/ Linux Distributions, MAC OS X Chrome OS, Mobile OS</p>	4
2.	<p><b>Process Management-Basic Concepts of Processes</b>-Operations on Processes, Process State Model and Transitions, Process Control Block (PCB), Context Switching. Introduction to Threads, <b>Scheduling Concepts</b>-Basic Concepts of</p>	5

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	Scheduling, Types of Schedulers, Scheduling Criteria, Scheduling Algorithms: FCFS, SJF, Priority, Round-Robin, Multilevel Queue.	
3.	<b>Process Coordination only introduction. Basic Concepts of Inter-Process Communication and Synchronization</b> - Race Conditions, Critical Regions and Problems, Peterson's Solution, Synchronization Hardware and Semaphores, Classic Problems of Synchronization, Message Passing. <b>Introduction to Deadlocks</b> -System Model, Deadlock Characterization, Deadlock Detection and Recovery, Deadlock Prevention, Deadlock Avoidance.	5
4.	<b>Memory Management, Basic Concepts of Memory Management</b> , Swapping, Contiguous Memory Allocation, Paging, Structure of Page Tables, Segmentation, Basic Concepts of Virtual Memory, Demand Paging, Copy-on-Write, Page Replacement Algorithms, Thrashing.	5
5.	<b>Storage Management, Basic Concepts of File Systems</b> - File Access Methods, Directory Structure, File-System Implementation, Allocation Methods, Free Space Management, Overview of Mass Storage Structure, Disk Structure, Disk Scheduling, RAID Structure, Introduction to I/O Systems	5
6.	<b>Special-purpose Operating Systems, Types of Operating Systems</b> -Open-source and Proprietary Operating Systems, Distributed Operating Systems, Network Operating Systems, Embedded Operating Systems, Cloud and IoT Operating Systems, Real-Time Operating Systems, Mobile Operating Systems, Multimedia Operating Systems, Comparison of Functions in Various Special-purpose Operating Systems.	4
<b>TOTAL</b>		<b>28</b>

**Text Books:**

1. A. Silberschatz, P. Galvin, G. Gagne, Operating System Concepts, 10th ed., Wiley, 2018.
2. W. Stallings, Operating Systems: Internal and Design Principles, 9th ed., Pearson, 2018.
3. A. Tanenbaum, Modern Operating Systems, Pearson, 4th ed., 2015.
4. S. Das, Unix Concepts and Applications, 4th ed., McGraw Hill, 2017.
5. R. Michael, Mastering Unix Shell Scripting, 2nd ed., Wiley, 2008.
6. D. Ambawade, D. Shah, Linux Labs and Open Source Technologies, Dreamtech Press, 2014.

**Reference Books:**

1. N. Chauhan, Principles of Operating Systems, 1st ed., Oxford University Press, 2014.
2. A. Tanenbaum and A. Woodhull, Operating System Design and Implementation, 3rd ed., Pearson.
3. R. Arpaci-Dusseau and A. Arpaci-Dusseau, Operating Systems: Three Easy Pieces, CreateSpace Independent Publishing Platform, 1st ed., 2018.
4. Y. Kanetkar, Unix Shell Programming, BPB Publications, 2003.
5. B. Forouzan and R. Gilberg, Unix and Shell Programming, Cengage Learning, 2003.

**E-Resources:**

1. <https://www.nptel.ac.in>
2. <https://swayam.gov.in>
3. <https://www.coursera.org/>

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)					<b>Semester:</b> II				
<b>Course:</b> IoT Innovation with Arduino					<b>Code:</b> 25ECVS202				
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	04	-	02	-	-	50	-	-	50

**Prerequisites:**

C/C++ and Python, familiarity with hardware components such as sensors and microcontrollers, and knowledge of data analytics and cloud computing concepts.

**Course Objectives:**

1. To provide a comprehensive introduction to IoT covering fundamentals, architecture, platforms, real-world examples, components, communication technologies, and challenges.
2. To develop proficiency in simulating Arduino Uno projects, including understanding its architecture, utilizing the IDE for Arduino software development, implementing Arduino libraries
3. To familiarize participants with sensor and actuator operations through hands-on experience with Arduino, including interfacing various sensors and actuators.
4. To familiarize participants with the fundamentals of wireless networking using the ESP8266 WiFi module, including understanding different Wi-Fi libraries, configuring a web server, and transmitting sensor data.
5. To compare and contrast M2M (Machine-to-Machine) communication with IoT (Internet of Things) and analyze the performance and suitability of MQTT, HTTP, and CoAP communication protocols.
6. To explore and understand the integration of virtualization concepts, cloud architecture, cloud computing benefits, and various cloud services, alongside IoT-specific platforms and protocols like Thing Speak API and MQTT, with a focus on interfacing ESP8266 microcontrollers with web services.

**Course Outcomes:**

<b>CO1</b>	Gain a foundational understanding of IoT concepts, enabling them to identify key components, discuss architecture and protocols, recognize various platforms and real-world applications, and understand challenges associated with IoT implementation.
<b>CO2</b>	Gain practical skills in simulating and programming Arduino Uno projects, enabling them to create and test embedded systems before physical implementation virtually.
<b>CO3</b>	Gain practical skills in integrating temperature, humidity, motion, light, gas sensors, relay switches, and servo motors with Arduino for real-world applications.
<b>CO4</b>	Gain practical skills in setting up and managing basic wireless networks with ESP8266, deploying web servers, and integrating sensor data for web-based applications.
<b>CO5</b>	Determine the optimal communication protocol for various IoT applications based on efficiency, scalability, and interoperability considerations.
<b>CO6</b>	Gain practical knowledge and skills in designing and implementing cloud-based IoT solutions using virtualization, cloud services (SaaS, PaaS, IaaS), and IoT-specific platforms, enhancing proficiency in ESP8266 integration with web services for real-world applications.

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING****Course Contents:**

Unit	Description	Duration (Hrs.)
1.	<b>Introduction to IOT:</b> Fundamentals of IoT, IoT Architecture and Protocols, Platforms for IoT, Real-world Examples of IoT, Overview of IoT, Components and Communication Technologies, Challenges in IoT	9
2.	<b>Arduino Simulation Environment:</b> Arduino Uno Architecture, Setting up the IDE and Writing Arduino Software, Arduino Libraries, Basics of Embedded C Programming for Arduino, Interfacing LED, Push Button, and Buzzer with Arduino, Interfacing Arduino with LCD.	9
3.	<b>Sensor &amp; Actuators with Arduino:</b> Overview of Sensor Operation, Analog and Digital Sensors, Interfacing Temperature, Humidity, Motion, Light, and Gas Sensors with Arduino, Interfacing Actuators with Arduino, Interfacing Relay Switches and Servo Motors with Arduino.	10
4.	<b>Basic Networking with ESP8266 Wi-Fi module:</b> Fundamentals of Wireless Networking, Overview of the ESP8266 Wi-Fi Module, Different Wi-Fi Libraries, Web Server: Introduction, Installation, and Configuration, Sending Sensor Data to a Web Server.	10
5.	<b>IoT Protocols:</b> M2M (Machine-to-Machine) vs. IoT (Internet of Things), Communication Protocols MQTT, HTTP, and CoAP	9
6.	<b>Cloud Platforms for IOT:</b> Virtualization Concepts and Cloud Architecture, Benefits of Cloud Computing, Cloud Services: SaaS, PaaS, IaaS, Cloud Providers and Their Offerings, Overview of IoT Cloud Platforms, Thing Speak API and MQTT, Interfacing ESP8266 with Web Services.	9
<b>TOTAL</b>		<b>56</b>

**List of Experiments**

- Exploring the Fundamentals and Architecture of IoT.
- Real-World IoT Applications and Communication Technologies.
- Interfacing and Programming Basic Components with Arduino.
- Interfacing Arduino with an LCD Display.
- Interfacing Sensors with Arduino.
- Interfacing Actuators and Control Mechanisms with Arduino.
- Evaluating Wi-Fi Module Performance.
- Implementing Sensor Data Transmission via Web Server.
- Comparative Analysis of Data Transfer Efficiency in M2M and IoT Networks.
- Security Analysis of Communication Protocols in IoT Environments.
- Evaluating Cloud Service Models.
- Integration of IoT Devices with Cloud Platforms.

**Project**

Here are some guidelines to consider when planning and executing IoT projects:

- Define Clear Objectives
- Select Appropriate Technology



## DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

- 3) Design for Scalability
- 4) Ensure Data Security
- 5) Consider Interoperability
- 6) Focus on User Experience
- 7) Optimize Power Efficiency
- 8) Comply with Regulations
- 9) Test and Validate
- 10) Plan for Maintenance and Updates
- 11) Document and Share Knowledge

Engage Stakeholders

### Text Books:

- 1. Kamal, R., "Internet of Things – Architecture and Design Principles," 1<sup>st</sup> Edition, McGraw Hill, 2017.
- 2. Simone Cirani, "Internet of Things - Architectures, Protocols and Standards," Wiley, 2018.
- 3. Alessandro Bassi, "Enabling Things to Talk - Designing IoT Solutions with the IoT Architectural Reference Model," Springer, 2013.

### Reference Books:

- 1. Alasdair Gilchrist, "Industry 4.0: The Industrial Internet of Things," A press, 2016.
- 2. Sudip Misra, Chandana Roy, Anadarup Mukherjee, "Introduction to Industrial Internet of Things and Industry 4.0," CRC Press, 2020.
- 3. Giacomo Veneri, Antonio Capasso, "Hands-on Industrial Internet of Things," Packt Press, 2018.

### E-Resources:

- 1. <https://www.arduino.cc/>
- 2. <https://www.tinkercad.com/>
- 3. [https://www.tutorialspoint.com/internet\\_of\\_things/index.htm](https://www.tutorialspoint.com/internet_of_things/index.htm)
- 4. <https://thingspeak.com/>
- 5. <https://www.nabto.com/guide-iot-protocols-standards/>
- 6. <https://thingsboard.io/>

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)				<b>Semester:</b> II					
<b>Course:</b> Professional Development - II				<b>Code:</b> 25ECCC203					
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	04	-	02	-	-	25	-	-	25

**Course Objectives:**

1. To introduce students on professional development skills and its importance in building personal and professional life.
2. To bring in self-awareness and realization of Values, Self-discipline and self-grooming for betterment of life and contribution to our Society.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Understand the interpersonal skills importance and finding skill gaps for development.
<b>CO2</b>	Know how to be effective in managing our time with application of simple tools & techniques.
<b>CO3</b>	Know the effective components of teamwork and how to be effective in our role for team performance and goals.

**Course Contents:**

Unit	Description	Duration (Hrs.)
1.	<b>Interpersonal Skills:</b> Understanding on IP skills; Essentials of IP; How to develop IP skills.	24
2.	<b>Time management:</b> What is time management? Time study and mapping; Knowing the time management tools & techniques; How to apply tools & techniques for effective time management; Self-evaluation.	16
3.	<b>Teamwork:</b> Team and Individual thinking; Characteristics of Teamwork; Importance at work profession; Benefits	16
<b>TOTAL</b>		<b>56</b>

**Text Books:**

1. Dr. P. K. Sinha, "Interpersonal Skills for Managers", Sage Publications.

**Reference Books:**

1. John C. Maxwell and Les Parrott, "25 Ways to Win with People", Thomas Nelson, 2013.
2. Robert Bolton, "People Skills: How to Assert Yourself, Listen to Others, and Resolve Conflicts", Touchstone, 1986.
3. Chris Bailey, "The Productivity Project: Accomplishing More by Managing Your Time, Attention, and Energy", Crown Business, 2016.
4. Jon Gordon, "The Power of a Positive Team: Proven Principles and Practices that Make Great Teams Great", Wiley, 2017.

**E-Resources:**

1. Coursera - "Improving Your Interpersonal Skills", <https://www.coursera.org/learn/interpersonal-skills>
2. Coursera - "Leading Teams", <https://www.coursera.org/learn/leading-teams>

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)				<b>Semester:</b> II					
<b>Course:</b> Liberal Learning – II (Guitar)				<b>Code:</b> 25ECCC204A					
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25

**Prerequisites:**

Basic knowledge of Indian classical music and Guitar musical instrument.

**Course Objectives:**

1. To enhance guitar skills through intermediate fingerpicking, lead techniques, and genre exploration, culminating in a polished final performance.

**Course Outcomes:** After completion of this course, students will be able to -

**CO1** Execute intermediate fingerpicking techniques with precision and rhythm.

**CO2** Apply advanced lead guitar techniques and pentatonic scales effectively.

**CO3** Perform confidently across various genres including blues, rock, folk, and classical.

**CO4** Deliver a polished final performance through focused practice and preparation.

**Course Contents:**

Sr. No.	Description	Duration (Hrs.)
1.	Rhythm and Timing.	2
2.	Time Signatures.	2
3.	Understanding Basic Rhythms.	2
4.	Circle of Fifths.	2
5.	Introduction to Minor Scales.	2
6.	Advanced Chord Shapes.	2
7.	Introduction to Lead Techniques.	2
8.	Introduction to Pentatonic Scale.	2
9.	Practice and Review.	2
10.	Exploring Different Genres.	2
11.	Final Project Planning.	2
12.	Intensive Practice.	2
13.	Pre-Performance Preparation.	2
14.	Final Performance.	2
<b>TOTAL</b>		<b>28</b>

**Text Books:**

1. David Hodge, "Guitar Theory", DK Publishing.

**Reference Books:**

1. Russ Shipton, "The Complete Guitar Player", Published by Wise.
2. Vincent Ong, Alfred Khp, "Classical Guitar Advanced Studies Repertoires", Dynamic Publication.

**E-Resources:**

<https://www.youtube.com/watch?v=BBz-Jyr23M4>

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)				<b>Semester:</b> II					
<b>Course:</b> Liberal Learning – II (Singing)				<b>Code:</b> 25ECCC204B					
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25

**Prerequisites:**

Basic knowledge of Indian classical music in singing.

**Course Objectives:**

1. To develop advanced singing techniques and ear training through Indian classical music, focusing on repertoire selection, effective rehearsal, and performance presentation.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Master legato, staccato, and advanced vocal methods in Indian classical music.
<b>CO2</b>	Improve musical ear through rigorous training and diverse classical repertoire.
<b>CO3</b>	Apply effective rehearsal strategies to prepare and present a polished performance.
<b>CO4</b>	Deliver a well-executed performance of selected Indian classical pieces with artistic expression

**Course Contents:**

Sr. No.	Description	Duration (Hrs.)
1.	Vibrato and Ornamentation.	2
2.	Range Extension.	2
3.	Legato and Staccato.	2
4.	Advanced Ear Training.	2
5.	Basics of Indian Semi Classical Music.	2
6.	Improvisation Techniques.	2
7.	Selecting Repertoire for Performance.	2
8.	Rehearsal Techniques.	2
9.	Dress Rehearsal.	2
10.	Final Performance.	2
11.	Performance Review.	2
12.	Exploring New Repertoire.	2
13.	Advanced Techniques and Styles.	2
14.	Course Recap and Future Directions.	2
<b>TOTAL</b>		<b>28</b>

**Text Books:**

1. Dr. Theodore Dimon, "Anatomy of the Voice, This Is a Voice".

**Reference Books:**

1. Richard Miller, "The Structure of Singing", Schirmer Books, London.
2. Jennifer Hamady, "The Art of Singing", Published by Hal Leonard.

**E-Resources:**

1. <https://www.youtube.com/watch?v=4hNq9qykOyE>
2. <https://www.youtube.com/watch?v=b14gkmECz-Y>



## DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)				<b>Semester:</b> II					
<b>Course:</b> Liberal Learning – II (Cinematography)				<b>Code:</b> 25ECCC204C					
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25

### **Prerequisites:**

A basic understanding of film theory, Camera operation, Lighting techniques and visual storytelling is essential for cinematography.

### **Course Objectives:**

1. To master videography by learning camera techniques, shooting methods, and editing, culminating in a final project showcasing advanced skills in video production.

### **Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Operate camera components and techniques for steady, sharp video shooting.
<b>CO2</b>	Apply rule of thirds, framing, and stabilization methods effectively.
<b>CO3</b>	Use advanced editing tools and sound design for polished video projects.
<b>CO4</b>	Deliver a comprehensive final video project demonstrating learned skills.

### **Course Contents:**

Sr. No.	Description	Duration (Hrs.)
1.	Introduction to Videography	2
2.	Understanding camera components (lens, sensor, viewfinder)	2
3.	Techniques for steady shooting (tripods, handheld, gimbals)	2
4.	Understanding the rule of thirds, leading lines, and framing in video	2
5.	In-depth explanation of the exposure triangle: aperture, shutter speed, and ISO	2
6.	Importance of audio in videography	2
7.	Techniques for achieving sharp focus	2
8.	Motion and Stabilization	2
9.	Storyboarding and Planning	2
10.	Filming Techniques	2
11.	Introduction to Video Editing	2
12.	Introduction to advanced editing tools (color correction, audio editing, effects)	2
13.	Sound Design and Mixing	2
14.	Final Project Presentation and Review	2
<b>TOTAL</b>		<b>28</b>

### **Text Books:**

1. Tania Hoser, "Introduction to Cinematography", Taylor & Francis.

### **Reference Books:**

1. Anat Pick, "Screening Nature", Berghahn Books.
2. Blain Brown, "Cinematography: Theory and Practice", Taylor & Francis.

### **E-Resources:**

1. <https://youtu.be/V7z7BAZdt2M?si=to4yQ46zEKRbxK0m>
2. [https://youtu.be/WXdAX0No2hM?si=GZu\\_mJsmyJ7NGnAU](https://youtu.be/WXdAX0No2hM?si=GZu_mJsmyJ7NGnAU)



## DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)					<b>Semester:</b> II				
<b>Course:</b> Liberal Learning – II (Dance)					<b>Code:</b> 25ECCC204D				
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25

### Prerequisites:

Good stamina, flexibility and familiarity with simple rhythmic patterns and beats.

### Course Objectives:

1. To develop advanced dance techniques, expressive skills, and performance readiness in Indian classical dance, culminating in a final performance.

### Course Outcomes:

After completion of this course, students will be able to -

<b>CO1</b>	Develop advanced techniques in footwork, postures, and hand gestures, with a focus on fluidity and expression.
<b>CO2</b>	Embody various characters and emotions through in-depth exploration of Abhinaya (expressional dance).
<b>CO3</b>	Execute learned dance pieces with precision, synchronization, and advanced rhythmic variations.

### Course Contents:

Sr. No.	Description	Duration (Hrs.)
1.	Introduction to Character Portrayal.	2
2.	Rehearsal and Feedback.	2
3.	Advanced Footwork and Postures.	2
4.	Advanced Hand Gestures and Movements.	2
5.	Rhythmic Variations and Combinations.	2
6.	Rehearsal of Dance Piece.	2
7.	Performance Techniques.	2
8.	Integrating Steps and Expressions.	2
9.	Full Dress Rehearsal.	2
10.	Improvisation and Creative Movement.	2
11.	Corrections and Adjustments.	2
12.	Mini Performance.	2
13.	Introduction to Abhinaya in Depth.	2
14.	Preparing a New Short Dance Item.	2
<b>TOTAL</b>		<b>28</b>

### Text Books:

1. Kapila Vatsyayan, "Indian Classical Dance", Publications Division Ministry of Information & Broadcasting.

### Reference Books:

1. Shubhada Varadkar, "The Glimpse of Indian Classical Dance", Krimiga Books, Krimiga Content Development Pvt. Ltd.

### E-Resources:

1. [https://youtu.be/VP2jLLk8\\_jA?si=zg6\\_muy1w7jE5mbi](https://youtu.be/VP2jLLk8_jA?si=zg6_muy1w7jE5mbi)
2. <https://youtu.be/xZEP4XupwJA?si=YBt3RmcHxCRC2JSr>



## DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)					<b>Semester:</b> II				
<b>Course:</b> Synthesizer (Keyboard)					<b>Code:</b> 25ECCC204E				
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25

### Prerequisites:

Basic knowledge of Indian classical music and Keyboard musical instrument.

### Course Objectives:

1. To develop advanced musical skills through complex progressions, improvisation, and composition, culminating in a polished performance and mastery of selected repertoire.

### Course Outcomes:

After completion of this course, students will be able to -

**CO1** Apply complex chord progressions and advanced scales effectively in performance.

**CO2** Demonstrate proficiency in improvisation and advanced chord voicings.

**CO3** Perform selected repertoire with refined technique and stage presence.

**CO4** Successfully showcase learned skills through a polished recital or performance.

### Course Contents:

Unit	Description	Duration (Hrs.)
1.	Introduction to more complex progressions (e.g., ii-V-I)	2
2.	Basics of improvisation	2
3.	Learning advanced scales (e.g., blues scale, pentatonic scale)	2
4.	Learning advanced chord voicings and inversions	2
5.	Advanced Arpeggios and Runs	2
6.	Basics of composing music	2
7.	Initial practice on selected repertoire	2
8.	Focused practice on repertoire pieces	2
9.	Understanding stage presence and performance techniques	2
10.	Final adjustments and practice on repertoire	2
11.	Attending or reviewing a masterclass	2
12.	Receiving personalized feedback on playing	2
13.	Dress rehearsal for recital or performance	2
14.	Showcasing learned skills and pieces	2
		<b>TOTAL</b> <b>28 hrs.</b>

### Text Books:

1. Chuan C. Chang, Fundamentals of Piano Practice, Createspace Independent Publishing Platform

### Reference Books:

1. Michael Rodman, "Keyboard for the Absolute Beginners", Alfred Publishing
2. Davis Dorrough, "Piano Scales".

### E-Resources:

1. [https://youtu.be/2mPS-2guHVo?si=8X\\_4KKezIdrMejLH](https://youtu.be/2mPS-2guHVo?si=8X_4KKezIdrMejLH)
2. <https://youtu.be/tEtukfFv3Wk?si=2iJ8wdD0dfjWauPb>

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)				<b>Semester:</b> II					
<b>Course:</b> Liberal Learning – II (Basketball)				<b>Code:</b> 25ECCC204F					
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25

**Prerequisites:**

Proper health, Basic knowledge of rules of the game.

**Course Objectives:**

1. To master advanced basketball skills, strategies, and mental conditioning to excel in team play, complex scenarios, and tournament preparation.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Demonstrate mastery of advanced dribbling, passing, shooting, and defensive techniques.
<b>CO2</b>	Apply complex defensive systems, advanced team play, and game strategies in mixed scenarios.
<b>CO3</b>	Develop the mental toughness, conditioning, and strategic insights needed for successful tournament performance

**Course Contents:**

Sr. No.	Description	Duration (Hrs.)
1.	Advanced Dribbling Techniques	2
2.	Advanced Passing Techniques	2
3.	Advanced Shooting Techniques	2
4.	Advanced Defense Techniques	2
5.	Position Specific Training	2
6.	Conditioning & Strength Training	2
7.	Mental Toughness & Focus	2
8.	Advance Team Play	2
9.	Complex Defensive System	2
10.	Mixed Scenarios & Situational Drills	2
11.	Tournament Preparation	2
12.	Advance Game Play & Strategy	2
13.	Mastery & Final Assessment	2
14.	Final Scrimmage	2
<b>TOTAL</b>		<b>28</b>

**Text Books:**

1. K.K. Sharma, "Basketball: Skills and Drills", Sports Publications

**Reference Books:**

1. Dr. P.K. Kher, "Basketball Coaching: A Complete Guide", Khel Prakashan
2. S. Reddy, "The Ultimate Guide to Basketball Training", Blue Rose Publisher

**E-Resources:**

1. Introduction to Exercise Physiology & Sports Performance, IIT Madras, <https://nptel.ac.in/courses/109106406>

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)					<b>Semester:</b> II				
<b>Course:</b> Liberal Learning – II (Cricket)					<b>Code:</b> 25ECCC204G				
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25

**Prerequisites:**

Proper health, Basic knowledge of rules of the game.

**Course Objectives:**

1. To develop advanced cricket skills and strategies in batting, bowling, and fielding, with a focus on mental conditioning, tactical execution, and competitive performance through intensive practice and match simulations.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Demonstrate advanced techniques in batting, bowling, and fielding, including targeted drills and intensive practice.
<b>CO2</b>	Apply batting and bowling strategies, and execute tactical plans during match simulations and competitive play.
<b>CO3</b>	Develop strong mental conditioning and teamwork skills, preparing for high-performance in competitive matches and final assessments.

**Course Contents:**

Sr. No.	Description	Duration (Hrs.)
1.	Batting Strategies.	2
2.	Bowling Strategies.	2
3.	Fielding Strategies.	2
4.	Match Simulations and Tactical Execution.	2
5.	Targeted Skill Improvement.	2
6.	Mental Conditioning.	2
7.	Intensive Match Simulations.	2
8.	Advanced Batting Drills.	2
9.	Advanced Bowling Drills.	2
10.	Fielding and Wicket keeping in Game Conditions.	2
11.	Game Analysis and Strategy Sessions.	2
12.	Final Skill Polishing.	2
13.	Teamwork and Communication.	2
14.	Competitive Matches and Final Assessments.	2
<b>TOTAL</b>		<b>28</b>

**Text Books:**

1. Sanjay Manjrekar, "Cricket Fundamentals", Orient BlackSwan
2. Ravi Shastri, "Winning Cricket: Skills and Strategies", Notion Press

**Reference Books:**

1. Sachin Tendulkar, "Playing It My Way", Hachette India
2. Rahul Dravid, "Cricket: The Game of Life", Penguin India

**E-Resources:**

1. Sports and Performance Nutrition, IIT Madras,  
[https://onlinecourses.nptel.ac.in/noc24\\_hs82/preview](https://onlinecourses.nptel.ac.in/noc24_hs82/preview)



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**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)					<b>Semester:</b> II				
<b>Course:</b> Liberal Learning – II (Rifle and Pistol Shooting)					<b>Code:</b> 25ECCC204H				
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25

**Prerequisites:**

Proper health, Basic knowledge of rules of the game.

**Course Objectives:**

1. To achieve advanced proficiency in rifle shooting through specialized training, technical refinement, and mental preparation for competitive performance.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Master advanced rifle shooting techniques and positions to achieve higher scores.
<b>CO2</b>	Develop strong mental preparation and focus techniques for peak performance and overcoming technical hurdles.
<b>CO3</b>	Gain specialized training and match practice, preparing them for ISSF events and advanced shooting challenges.

**Course Contents:**

Sr. No.	Description	Duration (Hrs.)
1.	Understand and learning about advance rifle position	2
2.	Advance technical knowledge	2
3.	Advance Technique Refinement	2
4.	Learning about advance shooting and technics for achieving score	2
5.	Specialized Training	2
6.	Mental Preparation and Focus	2
7.	Peak Performance and analyses	2
8.	Advanced Skills Development	2
9.	Tactical Applications and working about single shoot	2
10.	Advanced Challenges and Readiness	2
11.	Review and Consolidation	2
12.	Focus on technical and mental hurdles	2
13.	Person to person attention	2
14.	Match practice and preparation as per ISSF event	2
<b>TOTAL</b>		<b>28</b>

**Reference Books:**

1. David Watson, "ABCs of Rifle Shooting", Gun Digest (Imprint of KP Books), 2014

**E-Resources:**

1. Introduction to Exercise Physiology & Sports Performance, IIT Madras,  
<https://nptel.ac.in/courses/109106406>

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)				<b>Semester:</b> II					
<b>Course:</b> Liberal Learning – II (Volleyball)				<b>Code:</b> 25ECCC204I					
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25

**Prerequisites:**

Proper health, Basic knowledge of rules of the game.

**Course Objectives:**

1. To achieve advanced proficiency in volleyball by mastering complex techniques, strategic systems, and mental conditioning, while preparing for competitive play and tournament scenarios.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Demonstrate expertise in advanced serving, spiking, setting, and blocking techniques tailored to specific positions.
<b>CO2</b>	Implement complex offensive and defensive systems and adapt to mixed scenarios through situational drills and gameplay.
<b>CO3</b>	Develop mental toughness, conditioning, and strategic insights necessary for successful tournament preparation and performance.

**Course Contents:**

Sr. No.	Description	Duration (Hrs.)
1.	Advanced Serving Techniques	2
2.	Advanced Spiking Techniques	2
3.	Advanced Setting Techniques	2
4.	Advanced Blocking Techniques	2
5.	Position – Specific Training	2
6.	Conditioning & Strength Training	2
7.	Mental Toughness & Focus	2
8.	Game Analysis & Feedback	2
9.	Complex Offensive System	2
10.	Complex Defensive System	2
11.	Mixed Scenarios & Situational Drills	2
12.	Advanced Gameplay & Strategies	2
13.	Review & Reinforcement	2
14.	Tournament Preparation	2
<b>TOTAL</b>		<b>28</b>

**Text Books:**

1. Jitendra Kumar, "The Complete Guide to Volleyball", Blue Rose Publisher

**Reference Books:**

1. N. Ramachandran, "Volleyball: Steps to Success", Sports Publication

**E-Resources:**

1. <https://coachtube.com/course/volleyball/volleyball-for-beginners/7004>



## DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)					<b>Semester:</b> II				
<b>Course:</b> Liberal Learning – II (Football)					<b>Code:</b> 25ECCC204J				
<b>Teaching Scheme (Hrs/week)</b>				<b>Evaluation Scheme (Marks)</b>					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25

### Prerequisites:

Proper health, Basic knowledge of rules of the game.

### Course Objectives:

1. To enhance players' technical skills, tactical understanding, physical fitness, teamwork, and sportsmanship, fostering a comprehensive understanding and appreciation of the game.

### Course Outcomes:

After completion of this course, students will be able to -

<b>CO1</b>	To explain key concepts of transition play, positional drills, and the importance of endurance and stamina in football.
<b>CO2</b>	Apply advanced tactics during simulation matches, analyze high-pressure situations.
<b>CO3</b>	Students will design a game week routine that covers match preparation, mental and physical readiness, and post-match analysis, evaluating its impact on team performance and skills.

### Course Contents:

Sr. No.	Description	Duration (Hrs.)
1.	Transition Play.	2
2.	Positional Drills.	2
3.	Endurance and Stamina.	2
4.	Video Analysis and Feedback.	2
5.	Advanced Tactics and Strategy.	2
6.	High-Pressure Situations.	2
7.	Leadership and Team Roles.	2
8.	Refining Skills and Tactics.	2
9.	Match Preparation.	2
10.	Mental and Physical Preparation.	2
11.	Game Week Routine.	2
12.	Post Goalkeeper Training.	2
13.	Post-Match Analysis and Recovery.	2
14.	Simulation Matches.	2
<b>TOTAL</b>		<b>28</b>

### Text Books:

1. Srinivasan J. B, "Football Coaching: A Comprehensive Guide", Sports Publishing.

### Reference Books:

1. Rob Ellis, "The Complete Guide to Coaching Soccer", Meyer & Meyer Sport.

### E-Resources:

1. Udemy – Soccer Courses - <https://www.udemy.com/topic/soccer/>

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

<b>Program:</b> B. Tech. (Electronics and Computer Engineering)	<b>Semester:</b> II								
<b>Course:</b> Quality Management System - I	<b>Code:</b> ECAE201								
<b>Teaching Scheme (Hrs/week)</b>	<b>Evaluation Scheme (Marks)</b>								
<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Credit</b>	<b>CIE</b>	<b>ETE</b>	<b>TW</b>	<b>PR</b>	<b>OR</b>	<b>Total</b>

-	04	-	02	-	-	25	-	-	25
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**Prerequisites:**

Interactive mind-set for practical.

**Course Objectives:**

1. To acquire basic knowledge of QMS.
2. To understand the structure and requirements of a QMS.

**Course Outcomes:** After completion of this course, students will be able to -

<b>CO1</b>	Know the evolution of Quality and QMS.
<b>CO2</b>	Understand What is meant by Quality and its importance in an organization.
<b>CO3</b>	Understand the model of QMS and its objectives.
<b>CO4</b>	Know the standard requirements in QMS.

**Course Contents:**

<b>Unit</b>	<b>Description</b>	<b>Duration (Hrs.)</b>
1.	Quality & Standardization: Evolution of Quality and its changes, ISO for standardization, Standardization and its benefits.	14
2.	Introduction to QMS: Definition of Quality, Quality effect to organization, QMS & its benefits to organization, Terminologies.	14
3.	QMS Principles: Eight principles of QMS and its benefits – Customer focus, Leadership, People involvement, Process approach, System approach to management, Continual Improvement, Fact based decisions, Supplier relationship.	28
<b>TOTAL</b>		<b>56</b>

**Text Books:**

1. S. K. Bhattacharyya, "Quality Management Systems: Theory and Practice", PHI Learning.
2. M. S. B. Reddy, "Introduction to Quality Management", New Age International.

**Reference Books:**

1. J.M. Juran and Joseph A. De Feo, Introduction to Quality Management, McGraw-Hill Education.
2. Janet L. Horne, ISO 9001:2015 – A Complete Guide to Quality Management Systems, Quality Press.
3. Mark A. D. Hounsell, Fundamentals of Quality Control and Improvement, Wiley Publication.

**E-Resources:**

1. ISO 9001:2015 - Quality Management System (QMS), [https://alison.com/course/iso-9001-2015-quality-management-system-qms#google\\_vignette](https://alison.com/course/iso-9001-2015-quality-management-system-qms#google_vignette)
2. Coursera - Quality Improvement and Management, - <https://www.coursera.org/learn/quality-improvement-and-management>



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## DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

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**Note - From Semester II onwards after every semester during vacation, students has to undergo for internship compulsory. The evaluation will be done in next successive semester.**



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standard format must be duly signed by the authority, should be addressed to the HR manager or relevant authority.

5. **Confirmation Letter:** Students must submit the confirmation letter from the industry, research organization, or collegiate club to the Internship Coordinator and the Head of Department (HOD) office.
6. **Joining Report:** Upon commencing the internship, students must submit the joining report, joining letter, or a copy of the confirmation email to the Internship Coordinator and the HOD office.
7. **Faculty Mentor:** A faculty member will be assigned as a mentor to a group of students. The mentor will be responsible for monitoring, evaluating, and assessing student internship activities. The faculty mentor is also required to visit the internship location and submit formal feedback to the Internship Coordinator.
8. **Faculty Visits:** Faculty members are advised to visit the internship site once or twice during the internship period to monitor progress.
9. **Progress Report:** Students must submit progress report fortnightly to their faculty guide and the final internship report to the Internship Coordinator and department office.
10. **Evaluation Report:** After the completion of the internship, the mentor, along with the assessment panel members, should submit the evaluation report of the students to the department office and the Internship Coordinator.
11. **Internship Certificate:** Students must receive the Internship Certificate from the industry and submit it to the Internship Coordinator and department office.
12. **Presentation and Assessment:** Students are required to give a presentation on their internship work as part of the term work. The internship diary and report will also be verified and assessed.