



**HINDUSTAN**  
INSTITUTE OF TECHNOLOGY & SCIENCE  
(DEEMED TO BE UNIVERSITY)

**B. TECH. BIOTECHNOLOGY**

**(Duration: 4 Years)**

**CURRICULUM and SYLLABUS**

**(Applicable for Students admitted from Academic Year 2022-23)**

**DEPARTMENT OF CHEMICAL ENGINEERING**

**SCHOOL OF MECHANICAL SCIENCES**

**HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE**

# HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE

## **Motto:**

*To Make Every Man a Success and No Man a Failure*

## **Vision:**

*To be an International Institute of Excellence, providing a conducive environment for education with a strong emphasis on innovation, quality, research and strategic partnership blended with values and commitment to society.*

## **Mission:**

- *To create an ecosystem that promotes learning and world class research.*
- *To nurture creativity and innovation.*
- *To instil highest ethical standards and values.*
- *To pursue activities for the development of the Society.*
- *To develop national and international collaborations with institutes and industries of eminence.*
- *To enable graduates to become future leaders and innovators.*

## **Value Statement:**

*Integrity, Innovation, Internationalization.*

# DEPARTMENT OF CHEMICAL ENGINEERING

## **Vision:**

*To achieve the pinnacle of success through quality education, research and entrepreneurship in emerging areas of Chemical Engineering and Biotechnology.*

## **Mission:**

- *To provide innovative education empowered with excellent technical and leadership skills*
- *To create state-of-the-art infrastructure for research and training, promote scientific discovery and development by fostering relationship with research organizations and industries.*

## **PROGRAMME'S EDUCATIONAL OBJECTIVES (PEO'S):**

**PEO1.** *Apply the knowledge in the field of engineering biotechnology to pursue higher studies and careers in industries, consultancies and research institutions.*

**PEO2.** *Design, develop and provide solutions for product/processes/technology development*

**PEO3.** *Apply modern computational, analytical tools and techniques in biotechnology to address environmental challenges.*

## **PROGRAMME'S OUTCOMES (PO'S):**

- PO-1:** *Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.*
- PO-2:** *Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.*
- PO-3:** *Design processes for complex biotechnological problems that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.*
- PO-4:** *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.*
- PO-5:** *Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.*
- PO-6:** *Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the biotechnological practice.*
- PO-7:** *Understand the impact of biotechnology in societal and environmental context, and demonstrate the knowledge of, and need for sustainable development.*
- PO-8:** *Apply ethical principles and commit to professional ethics and responsibilities and norms of the biotechnological practice.*
- PO-9:** *Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.*
- PO-10:** *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.*
- PO-11:** *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.*

**PO-12:** *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.*

## **PROGRAMME'S SPECIFIC OUTCOMES (PSO'S):**

**PSO-1:** *Understand the mechanism and functions of cellular metabolism using biotechnological methods.*

**PSO-2:** *Optimizing the performance and tools in genetic engineering for synthesizing plant and animal products.*

**PSO-3:** *Designing a bioreactor using bioprocess engineering methods.*

**B. TECH BIOTECHNOLOGY**
**FRAMEWORK OF CURRICULUM 2022 (in line with NEP 2020)**
**SEMESTER – I**

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TC H
1	BS	EMA51001	Matrices and Calculus	3	0	2	4	2	5
2	BS	EPH51001	Engineering Physics	3	0	2	4	2	5
3	PC	ECS51002	Programming in Python	3	0	2	4	1	5
4	HS	EME51001	Engineering Graphics and Computer Aided Design	2	0	2	3	1	4
5	ES	ELS51002	Personality Development and Soft Skills	1	0	2	2	1	3
6	ES	EBT51400	FAB Lab for Biotechnologists	0	1	2	2	2	3
7	HS	EGE51400/ EGE51401/ EGE51402/ EGE51403	Fine Arts (Drawing)/ Fine Arts (Singing)/Fine Arts (Dance)/ Fine Arts (Music)	0	0	2	1	0	2
8	PC	EBT51402	Design Thinking for Biotechnologists	0	1	2	2	1	3
<b>Total</b>				<b>12</b>	<b>2</b>	<b>16</b>	<b>22</b>	<b>10</b>	<b>30</b>

**SEMESTER – II**

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS	EMA51002	Analytical Mathematics	3	0	2	4	2	5
2	BS	ECT51001	Engineering Materials	3	0	2	4	2	5
3	PC	EBT51001	Cell Biotechnology	2	1	2	4	1	5
4	HS	EGE51001	Universal Human Values	2	0	0	2	1	2
5	HS	ELS51001	Communication Skills	2	0	2	3	1	4
6	ES	EBT51401	Innovation Lab for Biotechnologists	0	1	2	2	2	3
7	HS	EGE51404/ EGE51405	Outreach (NCC)/Outreach (NSS)	0	0	2	1	0	2
8	HS	ELS51003/ ELS51004/ ELS51005	Regional Language (Tamil)/ Regional Language (Hindi)/ Regional Language (Telugu)	2	0	0	2	1	2
<b>Total</b>				<b>14</b>	<b>2</b>	<b>12</b>	<b>22</b>	<b>10</b>	<b>28</b>

SEMESTER – III									
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS	EMA510XX	Partial Differential Equations and Transforms	3	1	0	4	2	4
2	PC	EBT51002	Biochemistry	3	0	2	4	1	5
3	PC	EBT51003	Microbiology	2	0	2	3	1	4
4	DE	EBT51XXX	DE 1	2	0	2	3	0	4
5	NE	EBT51XXX	NE 1	2	0	2	3	0	4
6	EEC	EBT51800	Design Project – 1	0	0	2	1	2	2
7	ES	ECH51007	Sustainable Engineering Systems (Program Specific)	2	0	0	2	2	2
8	EEC	EBT51801	Internship -1 (To be carried out in summer after 2 <sup>nd</sup> semester and evaluated in 3 <sup>rd</sup> semester)	0	0	0	1	2	0
<b>Total</b>				<b>14</b>	<b>1</b>	<b>10</b>	<b>21</b>	<b>10</b>	<b>25</b>

SEMESTER – IV									
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS	EMA510XX	Numerical Methods	3	1	0	4	2	4
2	PC	EBT51004	Molecular Biology	3	0	2	4	2	5
3	PC	ECH51007	Chemical Process Heat Transfer	2	0	2	3	2	4
4	DE	EBT51XXX	DE 2	2	0	2	3	0	4
5	NE	EBT51XXX	NE 2	2	0	2	3	0	4
6	EEC	EBT51802	Design Project – 2	0	0	2	1	2	2
7	PC	EBT51005	Bioinformatics (Industry Collaborated Course)	2	0	2	3	2	4
8	PC	EBT51006	Protein Engineering	3	0	0	3	2	3
<b>Total</b>				<b>17</b>	<b>1</b>	<b>12</b>	<b>24</b>	<b>12</b>	<b>30</b>

**FRAMEWORK OF CURRICULUM 2022 (in line with NEP 2020)**

**SEMESTER – V**

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TC H
1	PC	EBT51007	Recombinant DNA Technology	3	0	2	4	2	5
2	PC	ECH51011	Chemical Reaction Engineering	2	1	2	4	2	5
3	PC	ECH51012	Mass Transfer	3	0	0	3	2	3
4	DE	EBT51XXX	DE 3	2	0	2	3	0	4
5	NE	EBT51XXX	NE 3	2	0	2	3	0	4
6	EEC	EBT51803	Design Project – 3	0	0	2	1	2	2
7	ES	EBT51008	Entrepreneurship	1	0	2	2	0	3
8	EEC	EBT51804	Internship -2 (to be evaluated in 5 <sup>th</sup> semester. To be carried out in summer after 4 <sup>th</sup> semester))	0	0	0	1	2	0
<b>Total</b>				<b>13</b>	<b>1</b>	<b>12</b>	<b>21</b>	<b>10</b>	<b>26</b>

**SEMESTER – VI**

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TC H
1	PC	EBT51009	Plant Biotechnology	2	1	2	4	2	5
2	PC	EBT51010	Metabolic Engineering	3	0	0	3	2	3
3	PC	EBT51011	Animal Biotechnology	2	0	2	3	2	4
4	DE	EBT51XXX	DE 4	2	0	2	3	0	4
5	NE	EBT51XXX	NE 4	2	0	2	3	0	4
6	PC	EBT51012	Case Study / Field Study / Product study	2	0	2	3	2	4
7	EEC	EBT51805	Design Project – 4	0	0	2	1	2	2
8	HS	EBT51XXX	Skill Development and Career Planning	0	0	2	1	2	2
<b>Total</b>				<b>13</b>	<b>1</b>	<b>14</b>	<b>21</b>	<b>12</b>	<b>28</b>



**FRAMEWORK OF CURRICULUM 2022 (in line with NEP 2020)**

**SEMESTER – VII**

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TC H
1	PC	EBT51013	Industrial Biotechnology	3	0	0	3	2	3
2	PC	EBT51014	Bioprocess Engineering	2	1	2	4	2	5
3	PC	EBT51015	Immunology	2	0	2	3	2	4
4	DE	EBT51XXX	DE 5	2	0	2	3	0	4
5	NE	EBT51XXX	NE 5	2	0	2	3	0	4
6	PC	EBT51016	Term Paper on Research Findings	2	0	0	2	2	2
7	ES	EBT51017	Research Methodology & IPR	2	0	0	2	2	2
8	EEC	EBT51806	Project Phase 1	0	0	6	3	2	6
<b>Total</b>				<b>15</b>	<b>1</b>	<b>14</b>	<b>23</b>	<b>12</b>	<b>30</b>

**SEMESTER – VIII**

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TC H
1	EEC	EBT51807	Project Phase 2	0	0	22	11	4	22
<b>Total</b>				<b>0</b>	<b>0</b>	<b>22</b>	<b>11</b>	<b>4</b>	<b>22</b>
<b>Total Credits for the Program</b>							<b>165</b>		

**CREDIT COUNT**

Semester	Credit Count
1	22
2	22
3	21
4	24
5	21
6	21
7	23
8	11
	165

## LIST OF DEPARTMENTAL ELECTIVES WITH GROUPING - SEMESTER WISE

SEM	COURSE	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
Elective 1									
3	DE	EBT51500	Essence of Biotechnology <sup>1</sup>	2	0	2	3	0	4
3	DE	EBT51501	Enzyme Engineering and Technology <sup>2</sup>	2	0	2	3	0	4
3	DE	EBT51502	Stem Cells in Health Care <sup>3</sup>	2	0	2	3	0	4
3	DE	EBT51503	Instrumental Analysis for Biotechnologists <sup>4</sup>	2	0	2	3	0	4
Elective 2									
4	DE	EBT51504	Food Biotechnology <sup>1</sup>	2	0	2	3	0	4
4	DE	EBT51505	Proteomics <sup>2</sup>	2	0	2	3	0	4
4	DE	EBT51506	Cancer Biology <sup>3</sup>	2	0	2	3	0	4
4	DE	EBT51507	Bio separation Technology <sup>4</sup>	2	0	2	3	0	4
Elective 3									
5	DE	EBT51508	Human Genomics <sup>1</sup>	2	0	2	3	0	4
5	DE	EBT51509	Structural Biology <sup>2</sup>	2	0	2	3	0	4
5	DE	EBT51510	Regenerative Medicine <sup>3</sup>	2	0	2	3	0	4
5	DE	EBT51511	Bio-nanotechnology <sup>4</sup>	2	0	2	3	0	4
Elective 4									
6	DE	EBT51512	Vaccine Biotechnology <sup>1</sup>	2	0	2	3	0	4
6	DE	EBT51513	Molecular Modeling and Drug Design <sup>2</sup>	2	0	2	3	0	4
6	DE	EBT51514	Clinical Research <sup>3</sup>	2	0	2	3	0	4
6	DE	EBT51515	Environmental Biotechnology <sup>4</sup>	2	0	2	3	0	4
Elective 5									
7	DE	EBT51516	Bioethics, IPR and Patents <sup>1</sup>	2	0	2	3	0	4
7	DE	EBT51517	Biopharmaceutical Technology <sup>2</sup>	2	0	2	3	0	4
7	DE	EBT51518	Animal Therapeutics <sup>3</sup>	2	0	2	3	0	4
7	DE	EBT51519	Marine Biotechnology <sup>4</sup>	2	0	2	3	0	4
<b><sup>1</sup>Molecular Engineering; <sup>2</sup>Protein Engineering; <sup>3</sup>Medical BioTechnology; <sup>4</sup>Bio Analytics</b>									

**LIST OF NON DEPARTMENTAL ELECTIVES WITH GROUPING -  
SEMESTER WISE**

SEM	COURSE	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
Elective 1									
3	NE	EBT51700	Phytoremediation	2	0	2	3	0	4
3	NE	EBT51701	Food Processing	2	0	2	3	0	4
Elective 2									
4	NE	EBT51702	Genetic Engineering	2	0	2	3	0	4
4	NE	EBT51703	Biopolymers	2	0	2	3	0	4
Elective 3									
5	NE	EBT51704	Biotechnology in Defense	2	0	2	3	0	4
5	NE	EBT51705	Biomaterials and their Applications	2	0	2	3	0	4
Elective 4									
6	NE	EBT51706	Biotechnology in Alternate energy Resources	2	0	2	3	0	4
6	NE	EBT51707	Biosafety and Hazard Management	2	0	2	3	0	4
Elective 5									
7	NE	EBT51708	Bio entrepreneurship	2	0	2	3	0	4
7	NE	EBT51709	Agro biotechnology	2	0	2	3	0	4

## SEMESTER – I

COURSE TITLE	MATRICES AND CALCULUS (Common to ALL B. Tech)				CREDITS	4									
COURSE CODE	EMA51001	COURSE CATEGORY	BS	L-T-P-S	3-0-2-2										
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3										
<b>ASSESSMENT SCHEME</b>															
CIA					ESE										
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / Lab records as approved by the Department Examination Committee "DEC"	Attendance	End Semester Examination (Theory)	End Semester Examination (Practical)									
15%	15%	10%	5%	5%	25%	25%									
Course Description	To make the student understand the basic concepts of matrices and calculus using MATLAB														
Course Objective	<ol style="list-style-type: none"> <li>To perform some simple operations on matrices</li> <li>To give a strong foundation on the basic concepts of differentiation and integration.</li> <li>To demonstrate the fundamental understanding of integrals</li> <li>To classify ordinary differential equations.</li> <li>To impart the knowledge of sequences and summation of series.</li> </ol>														
Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> <li>Calculate the inverse of the matrix using Cayley Hamilton theorem and diagonalize the matrix</li> <li>Determine the derivative and higher derivatives of a given function explicitly and integrate the standard functions using suitable differentiation and integration formulae</li> <li>Evaluate surface area and volume using multiple integrals</li> <li>Compute the solution of second order the differential equations</li> <li>Determine the convergence and divergence of the sequence using the appropriate tests.</li> </ol>														
<b>Prerequisites: Knowledge in calculus at high secondary level.</b>															
<b>CO, PO AND PSO MAPPING</b>															
CO	PO -1	PO -2	PO-3	PO-4	PO-5	PO -6	PO-7	PO-8	PO -9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3

CO-1	3	3	1	-	1	-	-	-	-	-	-	1	To be marked by respective department
CO-2	3	3	1	-	1	-	-	-	-	-	-	1	
CO-3	3	3	1	2	1	-	-	-	-	-	-	2	
CO-4	3	3	2	1	1	-	-	-	-	-	-	2	
CO-5	3	3	2	-	1	-	-	-	-	-	-	1	

1: Weakly related, 2: Moderately related and 3: Strongly related

<b>MODULE 1: MATRICES</b>													<b>(9L+6P)</b>
<p>Characteristic equation – Eigen values and Eigenvectors – Properties – Cayley Hamilton theorem (Statement only) – Verification and inverse of the matrix using Cayley Hamilton theorem- Diagonalization of matrices using similarity transformation</p> <p>Suggested Reading: Basics of Matrices</p> <p><b>Lab: Eigen values and Eigenvectors, Verification and inverse using Cayley Hamilton theorem- Diagonalization</b></p>												<p><b>CO-1</b></p> <p><b>BTL-3</b></p>	
<b>MODULE 2: DIFFERENTIAL AND INTEGRAL CALCULUS</b>													<b>(9L+6P)</b>
<p>Basic Concepts and Simple Problems in Differentiation and Integration-Partial differentiation – Total differentiation- Taylor’s series – Maxima and minima of functions of two variables. Integration – Methods of integration – Substitution method – Integration by parts – Integration using partial fraction – Bernoulli’s formula.</p> <p>Suggested Reading: Basics of differentiation and integration.</p> <p><b>Lab: Taylor’s series – Maxima and minima of functions of two variables, Integration using partial fraction</b></p>												<p><b>CO-2</b></p> <p><b>BTL-3</b></p>	
<b>MODULE 3: MULTIPLE INTEGRAL</b>													<b>(9L+6P)</b>
<p>Double integration – Cartesian and polar co-ordinates – Change of order of integration. Area as a double integral – Triple integration in Cartesian coordinates – Volume as a triple integral - Change of variables between Cartesian and polar coordinates.</p> <p>Suggested Reading: Line Integrals</p> <p><b>Lab: Area and Volume of double integration and triple integration.</b></p>												<p><b>CO-3</b></p> <p><b>BTL-3</b></p>	
<b>MODULE 4: ORDINARY DIFFERENTIAL EQUATIONS</b>													<b>(9L+6P)</b>

<p>Second order differential equations with constant coefficients – Particular integrals <math>-e^{ax}, \cos ax, \sin ax, x^m, e^{ax} \cos bx, e^{ax} \sin bx</math>, Solutions of homogeneous differential equations with variable coefficients – Variation of parameters.</p> <p>Suggested Reading: Basics of Differential Equations.</p> <p><b>Lab: Solution of Second order differential equations.</b></p>	<p><b>CO-4</b> <b>BTL-3</b></p>
<p><b>MODULE 5: SEQUENCE AND SERIES (9L+6P)</b></p>	
<p>Definition of Sequence and series with examples, Convergence, divergence and Oscillation of sequence and series, properties, Tests for convergence of series (Comparison test, Limit Comparison test, Integral test, Ratio test, D' Alembert's test, Alternating Series).</p> <p>Suggested Reading: Basics of sequence and series.</p> <p><b>Lab: Test the convergence and divergence.</b></p>	<p><b>CO-5</b> <b>BTL-3</b></p>
<p><b>TEXT BOOKS</b></p>	
1.	A. Chandrasekaran, G Kavitha (2019), <i>Matrices and Calculus</i> , Dhanam Publications, 1 <sup>st</sup> Edition, Chennai.
2.	B.S. Grewal (2017), <i>Higher Engineering Mathematics</i> , Khanna Publishers, 43 <sup>rd</sup> Edition, New Delhi.
3.	A. P. Santhakumaran, P. Titus P (2017), <i>Engineering Mathematics – II</i> , NiMetric Publications, 2 <sup>nd</sup> Edition, Nagercoil, India.
<p><b>REFERENCE BOOKS</b></p>	
1.	D. G. Duffy (2021), <i>Advanced Engineering Mathematics With MATLAB (Advances in Applied Mathematics)</i> , Chapman and Hall Publisher, 5 <sup>th</sup> Edition, CRC Press, USA.
2.	M. D. Weir, Joel Hass, Thomas (2016), <i>Calculus</i> , Pearson Publication, 12 <sup>th</sup> Edition, India.
3.	Srimantha Pal and S.C. Bhunia (2015), <i>Engineering Mathematics</i> , Oxford University Press, 1 <sup>st</sup> Edition, New Delhi, India.
<p><b>E BOOKS</b></p>	
1.	<a href="https://www.elsevier.com/books/matrix-calculus/bodewig/978-1-4832-3214-0">https://www.elsevier.com/books/matrix-calculus/bodewig/978-1-4832-3214-0</a>
2.	<a href="https://www.ebooks.com/en-er/book/209983367/matrix-calculus-kronecker-product-and-tensor-product-a-practical-approach-to-linear-algebra-multilinear-algebra-and-tensor-calculus-with-software-implementations-third-edition/yorick-hardy/">https://www.ebooks.com/en-er/book/209983367/matrix-calculus-kronecker-product-and-tensor-product-a-practical-approach-to-linear-algebra-multilinear-algebra-and-tensor-calculus-with-software-implementations-third-edition/yorick-hardy/</a>
<p><b>MOOC</b></p>	
1.	<a href="https://www.coursera.org/learn/introduction-to-calculus">https://www.coursera.org/learn/introduction-to-calculus</a>
2.	<a href="https://nptel.ac.in/courses/111105035">https://nptel.ac.in/courses/111105035</a>

COURSE TITLE		ENGINEERING PHYSICS (Common to ALL branches of Engineering)					CREDITS	4							
COURSE CODE	EPH51001	COURSE CATEGORY	BS			L-T-P-S	3-0-2-2								
Version	1.0	Approval Details				LEARNING LEVEL	BTL3								
<b>ASSESSMENT SCHEME</b>															
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"			Attendance	End Semester Examination								
15%	15%	10%	5%			5%	Theory 25%								
							Practical 25%								
Course Description	This course is based on the developing areas of physics integrating both the theoretical and practical training for engineering students. Application of the concepts to solve engineering problems, to acquire practical thinking and logical reasoning.														
Course Objective	<ol style="list-style-type: none"> <li>To evaluate various types of modulus of elasticity and impart knowledge on production and application of ultrasonic wave in SONAR and NDT.</li> <li>To provide a strong foundation on the concepts of crystal physics and thermal conductivity.</li> <li>To illustrate theoretically and experimentally the wave – particle duality.</li> <li>To evaluate the material properties based on energy band gap and magnetic moment.</li> <li>To make the students understand the production of lasers and propagation of light through an optical fiber.</li> </ol>														
Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> <li>Evaluate the elastic properties of materials and apply the properties of ultrasonic waves for industrial applications</li> <li>Evaluate the characteristics of crystal structure and the thermal conductivity of good and bad conductors.</li> <li>Solve the Schrodinger's wave equations and derive energy density based on Planck's hypothesis</li> <li>Apply the fundamental concepts to classify magnetic and semiconducting materials and thereby, illustrate their applications.</li> <li>Apply lasers and optical fibers as engineering tools</li> </ol>														
<b>Prerequisites:</b> Knowledge in fundamentals of Physics at higher secondary level															
<b>CO, PO AND PSO MAPPING</b>															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PSO 3

CO1	3	3	-	-	-	-	-	-	3	-	-	3	To be marked by respective department.
CO2	3	3	-	2	3	-	-	-	3	-	-	3	
CO3	3	3	-	-	1	-	-	-	3	-	-	3	
CO4	3	3	-	2	-	-	-	-	3	-	-	3	
CO5	3	3	-	-	3	-	-	-	3	-	-	3	
<b>1: Weakly related, 2: Moderately related and 3: Strongly related</b>													
<b>MODULE 1: PROPERTIES OF MATTER AND ULTRASONICS</b>												<b>(9L + 6P)</b>	
<p>Elasticity – Hooke’s law – Elastic Moduli – Young’s modulus of elasticity – Rigidity modulus - Bulk modulus – Twisting couple on a wire – Torsional pendulum – Determination of rigidity modulus of a wire – Depression of a cantilever – Non-uniform bending – Uniform bending – I shape girder.</p> <p>Introduction – Production of ultrasonic waves (Magnetostriction and Piezoelectric methods) – Properties of ultrasonic – Applications in SONAR and NDT.</p> <p><b>Practical component:</b></p> <p>Torsional pendulum – Determination of rigidity modulus of thin wire and moment of inertia of regular objects</p> <p>Non-uniform bending – Determination of Young’s modulus of wooden beam</p>												<b>CO1 BTL3</b>	
<b>MODULE 2: CRYSTALLOGRAPHY AND THERMAL PHYSICS</b>												<b>(9L + 6P)</b>	
<p>Amorphous and crystalline solids – Unit cell – Lattice parameters – Crystal system and Bravais lattices (Qualitative) – Miller indices – Interplanar spacing for cubic crystal system – Crystal structures SCC, BCC, FCC, HCP (no. of atoms, coordination number, atomic packing fraction calculations) – Bragg’s law – X-ray diffractometer.</p> <p>Thermal conductivity – Experimental determination of thermal conductivities of good and bad conductors – Forbe’s method (Theory and experiment) – Lee’s disc method for bad conductors.</p> <p><b>Practical component:</b></p> <p>Lee’s disc experiment – Determination of thermal conductivity of bad conductor</p>												<b>CO2 BTL3</b>	
<b>MODULE 3: QUANTUM PHYSICS</b>												<b>(9L + 6P)</b>	
<p>Black body radiation – Planck’s hypothesis – Photoelectric effect – Compton effect – Theory and experimental verification</p> <p>Physical significance of wave function – Schrodinger's wave equation – Time independent and time dependent equations – Particle in a 1D box – Quantum Well (no derivation)</p> <p><b>Practical component:</b></p> <p>Photoelectric effect – To plot the KE as a function of frequency for different metals.</p>												<b>CO3 BTL3</b>	
<b>MODULE 4: MAGNETISM AND SEMICONDUCTORS</b>												<b>(9L + 6P)</b>	
<p>Magnetic moment – Classification of magnetic materials (Dia, para, ferro, anti-ferro) – Domain theory of ferromagnetism – Hysteresis – Hard and soft magnetic materials – Memory applications.</p> <p>Classification of semiconductors – Direct and in-direct bandgap – Fermi energy level – Intrinsic and extrinsic semiconductors – <i>n</i>-type and <i>p</i>-type semiconductors (Qualitative) – Hall effect – Determination of Hall voltage (Theory and experiment) – Applications of Hall effect.</p> <p><b>Practical component:</b></p>												<b>CO4 BTL3</b>	



Current – Voltage (IV) characteristics of semiconductor diode		
<b>MODULE 5: MODERN OPTICS</b>		<b>(9L + 6P)</b>
Principles of laser – Stimulated absorption – Spontaneous emission – Stimulated emission – Population inversion – Pumping action – Active medium – Laser characteristics – Nd-YAG laser – CO <sub>2</sub> laser – Dye laser – Laser in Industrial applications. Optical fiber – Principle and propagation of light in optical fibers – Numerical aperture and acceptance angle – Types of optical fibers – Optical fiber as temperature sensors. <b>Practical component:</b> Laser – Determination of the wave length of the laser using grating Laser – Particle size determination using lycopodium powder		<b>CO5 BTL3</b>
<b>TEXT BOOKS</b>		
1	Rajendran V. (2017), <i>Engineering Physics</i> , Tata McGraw Hill Publications, 3 <sup>rd</sup> Edition, US.	
2	Gaur R. K. and Gupta S.L. (2014). <i>Engineering Physics</i> , 8 <sup>th</sup> edition, Dhanpat Rai publications (P) Ltd., New Delhi	
3	Mani P. (2016), <i>Engineering Physics</i> , Dhanam Publications, 13 <sup>th</sup> Edition, Chennai.	
<b>REFERENCE BOOKS</b>		
1.	Arthur Beiser (2017), <i>Concepts of Modern Physics</i> , Tata McGraw Hill Publications, 7 <sup>th</sup> Edition, US.	
2.	Halliday, Resnick and Walker (2021), <i>Fundamental of Physics Extended</i> , Wiley & Sons, 12 <sup>th</sup> Edition, US.	
3	Shaikh I. A, Kulkarni H. R, Mohril, S. F. and Khairnar (2018), <i>Engineering Physics</i> , Nirali Prakashan Publishers, 5 <sup>th</sup> Edition, Pune.	
<b>E BOOKS</b>		
	<a href="https://industri.fatek.unpatti.ac.id/wp-content/uploads/2019/03/042-Fundamentals-of-Physics-II-Electromagnetism-Optics-and-Quantum-Mechanics-R.-Shankar-Edisi-1-2016.pdf">https://industri.fatek.unpatti.ac.id/wp-content/uploads/2019/03/042-Fundamentals-of-Physics-II-Electromagnetism-Optics-and-Quantum-Mechanics-R.-Shankar-Edisi-1-2016.pdf</a>	
	<a href="https://zenodo.org/record/243407#.Y0EfilxBzIU">https://zenodo.org/record/243407#.Y0EfilxBzIU</a>	
	<a href="https://salmanisaleh.files.wordpress.com/2019/02/physics-for-scientists-7th-ed.pdf">https://salmanisaleh.files.wordpress.com/2019/02/physics-for-scientists-7th-ed.pdf</a>	
<b>MOOC</b>		
1.	<a href="http://nptel.ac.in/courses/115106061">http://nptel.ac.in/courses/115106061</a>	
2.	<a href="http://nptel.ac.in/courses/117101054/12">http://nptel.ac.in/courses/117101054/12</a>	

COURSE TITLE	PROGRAMMING IN PYTHON			CREDITS	4
COURSE CODE	ECS51002	COURSE CATEGORY	PC	L-T-P-S	3-0-2-1
Version	1.0	Approval Details	23 ACM, 06.02.2021	LEARNING LEVEL	BTL- 5
<b>ASSESSMENT SCHEME</b>					
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project / Practical	Surprise Test / Quiz	Attendance	ESE

15%	15%	20%	--	--	50%										
<b>Course Description</b>	<p>Computer programming skills are now becoming part of basic education as these skills are increasingly of vital importance for future job and career prospects. The Python programming language which is one of the most popular programming languages worldwide. The course shows how to use the free open-source Python to write basic programs and high level applications.</p> <p>This course is offered as a Theory Integrated Practical course by practicing Project Based Learning (PBL), emphasizing learning by doing, where the objective is to provide the students with the required hands-on exercises / projects that complements the theoretical understanding of the subject matters. The assessment is through the combination of written tests as well as practical through projects.</p>														
<b>Course Objective</b>	<p>The course should enable the students to</p> <ol style="list-style-type: none"> <li>1. To introduce basic concepts of Python programming language as well as common packages and libraries.</li> <li>2. To generate an ability to design, analyze and perform experiments on real life problems in mechatronics engineering using python.</li> </ol>														
<b>Course Outcome</b>	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> <li>1. Comprehend basic concepts in python.</li> <li>2. Write python program to solve scientific, mathematical problems</li> <li>3. Develop modular programs using functions and use data structures</li> <li>4. Use toolboxes/ libraries and design simple algorithms using Python to solve real time applications</li> </ol>														
<b>Prerequisites:</b>															
<b>CO, PO AND PSO MAPPING</b>															
CO	PO - 1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO - 10	PO- 11	PO- 12	PSO -1	PSO -2	PSO - 3
CO1	3	3	3	3	3	-	-	2	-	-	2	1	2	2	2
CO2	3	3	3	3	3	2	-	-	3	-	-	1	3	2	2
CO3	3	3	3	3	3	-	3	-	-	2	-	1	3	2	2
CO4	3	3	3	3	3	-	-	3	-	-	-	1	2	2	2
CO5	1	1	1	1	1	-	-	2	-	-	2	1	2	2	2
<b>1: Weakly related, 2: Moderately related and 3: Strongly related</b>															
<b>MODULE 1: PYTHON FUNDAMENTALS (9L+ 6P=15)</b>															
<p>Introduction to python and its applications. Installation of Python and setting up a programming environment such as Anaconda and Spyder</p> <p>Python Basics: Variable and variable types, Booleans, Numbers: integers, floats, fractions, complex numbers, basic operators (arithmetic, relational, logical, membership, identity)</p> <p><b>Practical component:</b></p> <ol style="list-style-type: none"> <li>1. Solve simple mathematical expressions using python</li> <li>2. Perform type conversion</li> </ol>													<b>CO-1 BTL-3</b>		

<b>Suggested Readings:</b>		
1. 10 Reasons to Learn Python Programming Language in 2022 2. Learning Python: From Zero to Hero		
<b>MODULE 2: STRINGS, LISTS, TUPLES</b>		<b>(9L+ 6P=15)</b>
Strings, lists, tuples, sets, dictionaries. bytes and byte arrays, Manipulating variables, indexing, slicing, String methods, list methods, list slicing, set methods, in built python functions, input and output functions. <b>Practical component:</b> 1. Perform string manipulation 2. Data sorting using lists 3. Write functions for data handling <b>Suggested Readings:</b> 1. Python programming for beginners		<b>CO-2 BTL-5</b>
<b>MODULE 3: CONTROL STATEMENTS, LOOP AND FILE HANDLING</b>		<b>(9L+ 6P=15)</b>
If, else, else if statements, for loops, range function, while loops, List comprehensions, functions in python. Introduction to OOP, Classes, Objects, Reading and writing files <b>Practical component:</b> 1. Write a python program using control statements 2. Develop objects and classes in python 3. Work with files for specific applications <b>Suggested Readings:</b> 1. Python programming for beginners		<b>CO-2 BTL-5</b>
<b>MODULE 4: PYTHON LIBRARIES</b>		<b>(9L+ 6P=15)</b>
Installing of different libraries, packages or modules. Basic concepts of the following libraries: NumPy, Matplotlib, Pandas, SciPy libraries <b>Practical component:</b> 1. Python programming using libraries <b>Suggested Readings:</b> 1. The Python Bible		<b>CO-4 BTL-5</b>
<b>MODULE 5: CASE STUDIES</b>		<b>(9L+ 6P=15)</b>
Case Studies using Python Solving a linear differential equation using SciKit and plotting the result in matplotlib. Image processing and manipulation and auto detection of any object based on color. Python programming for an Arduino/ Raspberry PI Machine Learning application using python case study that uses Python to solve department specific problems. <b>Practical component:</b> 1. Mini Project / Case studies <b>Suggested Readings:</b> 1. Python at Netflix		<b>CO-4 BTL- 5</b>
<b>TEXTBOOKS</b>		
	Dr. R. NageswaraRao (2018). <i>Core Python Programming</i> , Dreamtech Press, Second Edition	
	M.T. Savaliya and R.K.Maurya (2018). <i>Programming through Python</i> , StarEdu Solutions	
<b>REFERENCE BOOKS</b>		

1.	Python Crash Course: A Hands-On, Project-Based Introduction to Programming (2nd Edition)
2.	Head-First Python: A Brain-Friendly Guide (2nd Edition)
<b>E BOOKS</b>	
	<a href="https://devfreebooks.github.io/python/">https://devfreebooks.github.io/python/</a>
	"The Python Tutorial", <a href="http://docs.python.org/release/3.0.1/tutorial/">http://docs.python.org/release/3.0.1/tutorial/</a>
<b>E BOOKS</b>	
	<a href="https://devfreebooks.github.io/python/">https://devfreebooks.github.io/python/</a>
	"The Python Tutorial", <a href="http://docs.python.org/release/3.0.1/tutorial/">http://docs.python.org/release/3.0.1/tutorial/</a>

<b>COURSE TITLE</b>	<b>ENGINEERING GRAPHICS AND COMPUTER AIDED DESIGN (Aero, Auto, Civil, Bio-Tech, Mechanical)</b>			<b>CREDITS</b>	<b>3</b>
<b>COURSE CODE</b>	<b>EME51001</b>	<b>COURSE CATEGORY</b>	<b>ES</b>	<b>L-T-P-S</b>	<b>2-0-2-1</b>
<b>Version</b>	<b>1.0</b>	<b>Approval Details</b>		<b>LEARNING LEVEL</b>	<b>BTL-3</b>
<b>ASSESSMENT SCHEME</b>					
<b>First Periodical Assessment (Theory + Practical)</b>	<b>Second Periodical Assessment (Theory + Practical)</b>	<b>Weekly assignment/Observation / lab records and viva as approved by the DEC</b>	<b>Surprise Test/ Quiz etc., as approved by the DEC</b>	<b>Attendance</b>	<b>ESE (Theory + Practical)</b>
<b>15%</b>	<b>15%</b>	<b>10%</b>	<b>5%</b>	<b>5%</b>	<b>50%</b>
<b>Course Description</b>	This course broadly introduces the mechanical design using computer aided design tools and fundamentals of free hand sketching. It prepares the students to learn the basic concepts involved in technical drawing and computer graphics. It also emphasis on the principles of projections and visualization of part drawing.				
<b>Course Objective</b>	<ol style="list-style-type: none"> <li>To demonstrate the concepts of Engineering graphics and projection of straight lines using CAD software</li> <li>To visualize the solids in various orientations and to draw its projections</li> <li>To comprehend the concepts of isometric projections</li> <li>To draw the development of solid surfaces and to generate associated views of civil drawings.</li> <li>To visualize and draw views of the object by free hand sketch and to transform 3D models to 2D drawings using CAD tools</li> </ol>				

<b>Course Outcome</b>	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> <li>1. Demonstrate the concepts of Engineering graphics and projection of straight lines using CAD software.</li> <li>2. Apply the acquired knowledge to solve simple problems of regular solids.</li> <li>3. Create solid objects in isometric view using CAD software</li> <li>4. Develop the simple solids and to sketch the plan and elevation of the building drawings.</li> <li>5. Visualize the objects and to draw by free hand sketching.</li> </ol>
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**Prerequisites: Nil**

**CO, PO AND PSO MAPPING**

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

**1: Weakly related, 2: Moderately related and 3: Strongly related**

**MODULE 1: BASICS OF ENGINEERING GRAPHICS**

**(6L + 6P =12)**

Relevance of Graphics in Industry - BIS conventions and specifications - drawing sheet sizes - Lettering – Dimensioning - Scales. Drafting methods - Introduction to Computer Aided Drafting –Exposure to Solid Modelling software – Printer and Plotter – 3D printer. Introduction to Orthographic projections - Naming views as per BIS - First angle projection method. Projection of points and projection of Straight lines.

**Suggested Reading:** Solid modelling Software commands

**CO-1  
BTL-2**

**MODULE 2: PROJECTION OF SOLIDS**

**(6L + 6P =12)**

Projections of solids. Solids in simple positions and axis inclined to one plane only. Section of solids. Section planes inclined to Horizontal Plane only. True shape of the section. (Manual and CAD Drawing)

**Suggested Reading:** Solids inclined to both the planes. Section of solids with sectional planes inclined to VP.

**CO-2  
BTL-2**

**MODULE 3: ISOMETRIC PROJECTION**

**(6L + 6P =12)**

Concepts of isometric projection. Isometric scale, Isometric view of simple solids with sectional planes. (Manual and CAD Drawing)

**Suggested Reading:** Isometric view of solids with multiple sectional planes.

**CO-3  
BTL-3**

**MODULE 4: DEVELOPMENT OF SURFACES AND CIVIL DRAWING**

**(6L + 6P =12)**

Development of Surfaces of simple solids with simple sectional planes. Parallel line method and Radial line method only. (Manual and CAD Drawing)

Civil Drawing: PLAN and ELEVATION of Simple residential building. (Manual and CAD

**CO-4  
BTL-2**

Drawing) <b>Suggested Reading:</b> Development of Sphere, Sectional elevation of building drawing		
<b>MODULE 5: FREE HAND SKETCHING</b>		<b>(6L + 6P =12)</b>
Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Pictorial Projection methods - Layout of views- Conversion of pictorial views to orthographic view. <b>Suggested Reading:</b> Orthographic views to pictorial views		<b>CO-5 BTL-3</b>
<b>TEXT BOOKS</b>		
1.	Jeyapoovan, T., Engineering Graphics and Design, Vikas Publishing House Pvt Ltd., New Delhi, 8 <sup>th</sup> Edition, 2022.	
2.	P. Kannaiah, K. L. Narayana, K. Venkata Reddy, A Textbook on Engineering Drawing, BS Pub, 2016.	
<b>REFERENCE BOOKS</b>		
1.	Alf Yarwood, Introduction to AutoCAD – 2D and 3D Design, Newnes Elsevier, 2011	
2.	Bhatt N.D and Panchal V.M, Engineering Drawing: Plane and Solid Geometry, Charotar Publishing House, 2019.	
3.	Kirstie Plantenberg, Engineering Graphics Essentials, SDC Publications., fifth Edition, 2016.	
<b>E – Books</b>		
1.	<a href="https://www.amazon.in/Technical-Drawing-Engineering-Graphics-International-ebook/dp/B00IZ0FZHA">https://www.amazon.in/Technical-Drawing-Engineering-Graphics-International-ebook/dp/B00IZ0FZHA</a>	
<b>MOOC</b>		
1.	<a href="http://nptel.ac.in/courses/112103019/">http://nptel.ac.in/courses/112103019/</a>	
2.	<a href="https://nptel.ac.in/courses/112102304/">https://nptel.ac.in/courses/112102304/</a>	

COURSE TITLE		PERSONALITY DEVELOPMENT & SOFT SKILLS			CREDITS	2
COURSE CODE		ELS51002	COURSE CATEGORY	HS	L-T-P-S	1-0-2-1
Version	1.0	Approval Details	35 <sup>th</sup> ACM - 6 <sup>th</sup> Aug. 2022		LEARNING LEVEL	BTL – 4
ASSESSMENT SCHEME						
First Periodical Assessment	Second Periodical Assessment	Weekly assignment/ lab record and viva as approved by the Department Examination	Surprise Test / Quiz., as approved by the Department Examination Committee “DEC”	Attend ance	End Semester Examination (ESE) Theory + Practical	

		<b>Committee "DEC"</b>			
<b>15 %</b>	<b>15%</b>	<b>10 %</b>	<b>5 %</b>	<b>5 %</b>	<b>50%</b>

**Course Description**  
This course teaches the learners LSRW Skills which is needed in today's global workplace together with essential business vocabulary & grammar. It equips them to communicate effectively and at professional and social scenario which in turn makes them confident individuals. This course would help them to appear for Cambridge Certification and add value to their profile and validate their language proficiency.

- Course Objective**
1. To acquire self-confidence by which the learner can improve upon their informative listening skills by an enhanced acquisition of the English language.
  2. To provide an environment to Speak in English at the formal and informal levels and use it for daily conversation, presentation, group discussion and debate.
  3. To equip the students to Read, comprehend and answer questions based on literary, scientific and technological texts.
  4. To enhance the writing skills of the students via training in instructions, recommendations, checklists, process-description, letter-writing and report writing.
  5. To equip the learners in analyzing and applying creative thinking skills and participate in brainstorming, mind-mapping, audiovisual activities and excel in employability skills.

- Course Outcome**
- Upon completion of this course, the students will be able to
1. Demonstrate the ability to construct the grammatically correct sentences with accuracy and syntax structures.
  2. Integrating various components of English Language and determining it through reading and listening.
  3. Analyze and transcode data, construct different types of written essays, read complex passages and summarize ideas, create personal profiles in the form of a resume.
  4. Organize and articulate ideas, concepts, and perceptions in a comprehensive manner in written business correspondence, and speaking in formal and informal situations.
  5. Infer details about presentation skills and implementing it in various professional situations.

**Prerequisites:** Plus Two English-Intermediate Level

**CO, PO AND PSO MAPPING**

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
CO1	-	-	-	-	-	-	-	-	-	3	-	-	<b>To be marked by respective</b>		
CO2	-	-	-	-	-	-	-	2	2	3	-	-			

CO3	-	-	-	-	-	-	-	-	-	3	-	-	department
CO4	-	-	-	-	-	-	2	-	-	3	2	-	
CO5	-	-	-	-	-	-	-	-	2	3	2	3	
<b>1: Weakly related, 2: Moderately related and 3: Strongly related</b>													
<b>MODULE 1 : ATTITUDE</b>											<b>(3L+6P = 9)</b>		
<p><b>Grammar</b> : 1. Countable and uncountable nouns 2. Asking questions 3. Expressing likes 4. Introducing reasons 4. Talking about large and small differences. 5. Expressing Results</p> <p><b>Vocabulary:</b> 1. Recruitment Brochure: ability, certificate, course, etc., 2. Work, job, training course. 3. Job Responsibilities 4. Staff, Employee, member of Staff. 5. Phrases expressing enthusiasm 6. Adjective Forms</p> <p><b>Writing</b> : 1. Report Writing – Staff Training Report 2. A Website entry 3. A short Email and an Email of a job application.</p> <p><b>Reading</b> : Articles on Human Resources</p> <p><b>Soft Skills And Employability Skills (LAB): ATTITUDE:</b> The power of positive thinking – Positive self - talk – self-esteem and positive attitude who Am I? Attitude in the workplace – Building a positive attitude – Testing your attitude – Adaptability</p>												<b>CO-1 BTL-2</b>	
<b>MODULE 2 : GOAL SETTING</b>											<b>(3L+6P = 9)</b>		
<p><b>Grammar:</b> 1. Infinitive or verb + ing, 2. Prepositions in phrases describing trends 3. Formal requests 4. First and Second conditionals. 5. Phrases followed by a Verb + ing.</p> <p><b>Vocabulary:</b> 1. Word related to marketing (Launch, Play, Find out, Learn, Know, etc.,) 2. Revenue outcome 3. Adjective – noun collocations, 3. Last and latest</p> <p><b>Writing:</b> 1. A marketing Report 2. Email giving information – making an enquiry – answering enquiries – correcting information – confirming terms 3 Memo Writing</p> <p><b>Reading</b> : Articles on Marketing</p> <p><b>Soft Skills And Employability Skills (LAB): GOAL SETTING:</b> What is goal? - What are SMART goals? - How does SMART goal setting work? - Goals as commitment – Useful Guideline for goal setting – Trying personal and professional goals – Goals at the workplace – Cascading goals – Types of goals</p>												<b>CO-2 BTL-3</b>	
<b>MODULE 3 : TIME MANAGEMENT</b>											<b>(3L+6P = 9)</b>		
<p><b>Grammar:</b> 1. Prepositions in time phrases 2. Making recommendations 3. Phrases signaling parts of a presentation 4. Can and could</p> <p><b>Vocabulary:</b> 1. Financial Terms 2. Rising finance 3. Noun Phrases connected with starting companies 4. Assets, collateral etc.,</p> <p><b>Writing:</b> Formal Letter: 1. A letter of enquiry 2. Proposal Writing</p> <p><b>Reading</b> :Articles on Entrepreneurship</p> <p><b>Soft Skills And Employability Skills (LAB): TIME MANAGEMENT:</b> What is time management? Prioritization – Time stressors – Time stealers – Time management - Eisenhower Matrix– Strategies for effective time management – productivity pyramid – The four Ds of time management</p>												<b>CO-3 BTL-3</b>	
<b>MODULE 4 : EMOTIONAL INTELLIGENCE</b>											<b>(3L + 6P = 9)</b>		
<p><b>Grammar:</b> 1. Referencing 2. Using the Passives to express opinions and ideas. 3. Relative Clauses</p> <p><b>Vocabulary:</b> 1. Collocations describing reasons for meetings, 2. Collocations with meeting 3. Crucial, priceless, etc.,</p> <p><b>Writing:</b> Arranging to travel; an email agreeing to a request and making suggestions – giving instructions – about a business trip – announcing a job opportunity. 2. A letter</p>												<b>CO-4 BTL-3</b>	



informaing about a new service – complaint, <b>Reading</b> : Articles on Business abroad <b>Soft Skills And Employability Skills (LAB): EMOTIONAL INTELLIGENCE:</b> What is Emotional Intelligence? Enhancing your emotional self-awareness, - Emotional intelligence and change management – unfreezing the old, re-freezing the new – change and stress – emotional intelligence and crisis management.		
<b>MODULE 5 : LEADERSHIP</b>		<b>(3L + 6P = 9)</b>
<b>Grammar:</b> 1. Using the Definite Article 2. Expressing Causes 3. Reporting verbs and reported speech 4 Third Conditional(Imaginary) <b>Vocabulary</b> 1. Verb – Noun collocations 2. Issues, impact, etc., 3. Way or method 4. Words and phrases expressing numbers. <b>Writing:</b> Mail arranging a meeting, introducing a company and asking for information – giving suggestions 2. A memo asking for suggestions 3. A proposal for out sourcing. <b>Reading</b> : Articles on Change in Business <b>Soft Skills And Employability Skills (LAB): LEADERSHIP :</b> Qualities of a leader – Leadership and assertiveness – problem –solving and decision-making – Approaches to problem – solving and decision-making – Brainstorming – Cause-and-effect analysis		<b>CO-5 BTL-4</b>
<b>TEXT BOOKS</b>		
1	Brook-Hart, Guy (2019). Cambridge English Business Benchmark, Upper Intermediate. Cambridge University Press. India (Pages 208)	
2.	Pillai, Sabina. Fernandez, Agna. (2018). Soft Skills And Employability Skills. Cambridge University Press. India. (Pages 208)	
<b>REFERENCE BOOKS</b>		
1.	Murphy, Raymond (2019). Intermediate English Grammar. Cambridge University Press. India. (Pages 350)	
2.	Barnes, D., (2020). Exploratory talk for learning in Mercer, N. and Hodgkinson, S. (eds) Exploring Talk in School. London: Sage Publications. (Pages 208)	
3.	Dhanavel. S P (2018). English and Soft Skills. Orient BlackSwan. India. (Pages 136)	
4.	Goldsmith, Marshall & M.S. Rao. (2020) Soft Skills: Enhancing Employability. Dreamtech Press. India (Pages 256)	
<b>E Books</b>		
1	<a href="https://www.pdfdrive.com/basic-english-grammar-with-exercises-e12486779.html">https://www.pdfdrive.com/basic-english-grammar-with-exercises-e12486779.html</a>	
2	<a href="http://dspace.vnbrims.org:13000/jspui/bitstream/123456789/4733/1/Leadership%20The%20Power%20of%20Emotional%20Intelligence.pdf">http://dspace.vnbrims.org:13000/jspui/bitstream/123456789/4733/1/Leadership%20The%20Power%20of%20Emotional%20Intelligence.pdf</a>	
<b>MOOC Courses</b>		
1	<a href="https://www.edx.org/professional-certificate/ritx-communication-skills">https://www.edx.org/professional-certificate/ritx-communication-skills</a>	
2	<a href="https://www.coursera.org/specializations/people-and-soft-skills-for-professional-success">https://www.coursera.org/specializations/people-and-soft-skills-for-professional-success</a>	

<b>COURSE TITLE</b>	<b>FAB LAB FOR BIOTECHNOLOGISTS</b>							<b>CREDITS</b>	<b>2</b>						
<b>COURSE CODE</b>	<b>EBT51400</b>			<b>COURSE CATEGORY</b>		<b>ES</b>		<b>L-T-P-S</b>	<b>0-1-2-2</b>						
<b>Version</b>	<b>1.0</b>			<b>Approval Details</b>				<b>LEARNING LEVEL</b>	<b>BTL-3</b>						
<b>ASSESSMENT SCHEME</b>															
<b>First Periodical Assessment</b>	<b>Second Periodical Assessment</b>			<b>Weekly assignment/ Observation/ lab records as approved by DEC</b>		<b>Surprise Test / Quiz as approved by DEC</b>		<b>Attendance</b>			<b>ESE</b>				
<b>15%</b>	<b>15%</b>			<b>10%</b>		<b>5%</b>		<b>5%</b>			<b>50%</b>				
<b>Course Description</b>	The FAB Lab helps students to learn the basic laboratory skills in all the fundamental subjects like microbiology, biochemistry and molecular biology by following good laboratory practices.														
<b>Course Objective</b>	<ol style="list-style-type: none"> <li>To follow good laboratory practices (GLP) under aseptic condition</li> <li>To interpret anti-microbial properties of naturally available plants</li> <li>To isolate pigments and estimate toxicity of fertilizers</li> <li>To quantify the pollution potential of wastewater</li> <li>To estimate the concentration of biochemicals present in food items</li> </ol>														
<b>Course Outcome</b>	<p>After successful completion, the student will be able to</p> <ol style="list-style-type: none"> <li>Produce good lab practices (GLP) in the laboratory</li> <li>Calculate anti-microbial activity of plant extracts quantitatively</li> <li>Demonstrate procedure for isolation of pigments and toxicity assessment</li> <li>Apply the parameters to quantify pollution load in wastewaters</li> <li>Prepare the methods for determining concentration of bio chemicals present in food samples</li> </ol>														
<b>Prerequisites: NIL</b>															
<b>CO, PO AND PSO MAPPING</b>															
	<b>PO-1</b>	<b>PO-2</b>	<b>PO-3</b>	<b>PO-4</b>	<b>PO-5</b>	<b>PO-6</b>	<b>PO-7</b>	<b>PO-8</b>	<b>PO-9</b>	<b>PO-10</b>	<b>PO-11</b>	<b>PO-12</b>	<b>PSO-1</b>	<b>PSO-2</b>	<b>PSO-3</b>
<b>CO-1</b>	1	2	-	-	-	2	-	2	2	1	1	-	-	1	-
<b>CO-2</b>	1	-	2	1	1	2	-	-	2	1	2	-	1	-	2
<b>CO-3</b>	-	1	2	2	-	2	1	3	2	-	-	1	-	2	-
<b>CO-4</b>	1	2	1	1	1	-	1	3	1	2	2	-	-	2	1
<b>CO-5</b>	2	-	1	-	-	1	1	3	3	1	2	2	1	1	2

1: Weakly related, 2: Moderately related and 3: Strongly related

<b>MODULE 1: ATTACHED GROWTH BATCH REACTOR</b>		<b>(3L+6P)</b>
Reactor Setting - Seeding - Filling - Reaction - Settling - Decanting - Wastewater Quality Analysis- Biochemical Analysis. <b>Lab component:</b> Wastewater Quality Analysis and Biochemical Analysis		<b>CO-1 BTL-3</b>
<b>MODULE 2: ANTIMICROBIAL ACTIVITY</b>		<b>(3L+6P)</b>
Antimicrobial activity of plant extracts – antibacterial and antifungal; antibiotics; antimicrobial resistance; Minimal Inhibitory Concentration (MIC); Culture conditions. <b>Lab component:</b> Estimation of Inhibitory concentration using free radical scavenging assay; Antimicrobial study of medicinal plants		<b>CO-2 BTL-3</b>
<b>MODULE 3: TOXICITY AND BIODEGRADABILITY</b>		<b>(3L+6P)</b>
Contaminants and Pollutants. Properties of chemical contaminants. Recalcitrant compounds and xenobiotics; Acute and Chronic toxicity. Biodegradability assessment. <b>Lab component:</b> Toxicity analysis of pesticides/fertilizers; Biodegradability assessment of pharmaceuticals		<b>CO-3 BTL-3</b>
<b>MODULE 4: POLLUTION CONTROL</b>		<b>(3L+6P)</b>
Pollution – Soil, air, water. Wastewater characteristics. Pollution parameters. COD, BOD analysis and its importance; Sewage Treatment Plants and Effluent Treatment Plants. <b>Lab component:</b> Determination of Biochemical Oxygen Demand; Quantification of coliforms present in sewage sample.		<b>CO-4 BTL-3</b>
<b>MODULE 5: BIOCHEMICALS IN FOOD SAMPLES</b>		<b>(3L+6P)</b>
Biomolecules in food - Carbohydrates, lipids, proteins, minerals, vitamins and water- Types in the major nutrients – abundance of nutrients in food <b>Lab components:</b> Estimation of fructose/sucrose in fruit juices; Estimation of proteins from milk/egg white.		<b>CO-5 BTL-3</b>
<b>TEXTBOOKS</b>		
1	Seidman, L.A., Moore, C.J., Mowery, J. (2022). <i>Basic Laboratory Methods for Biotechnology</i> , Taylor & Francis, 3 <sup>rd</sup> Edition.	
2.	Hong, S.B., Rashid, M.B., Santiago-Vazquez, L.Z. (2016). <i>Methods in Biotechnology</i> , Wiley Publishers, 1 <sup>st</sup> Edition.	
3.	Hodgson, E., Levi, P. E. (2010). <i>A textbook of modern toxicology</i> . New York: Elsevier. 4 <sup>th</sup> Edition.	
<b>REFERENCE BOOKS</b>		

1.	FSSAI, M. (2016). <i>Manual of methods of analysis of foods</i> . Food Safety and Standards Authority of India.
2.	Karia, G. L., Christian, R. A. (2013). <i>Wastewater treatment: Concepts and design approach</i> . PHI Learning Pvt. Ltd. 2 <sup>nd</sup> Edition.
3.	Chandrabhan, V., Dakeshwar, V. (2022). <i>Handbook of Biomolecules: Fundamentals, Properties and Applications</i> . Elsevier. 1 <sup>st</sup> Edition.
<b>E BOOKS</b>	
1.	<a href="https://idcwebstorage1.blob.core.windows.net/pdc-identocard-knowledgebase/EPI%20Suite/EPI_Suite_User_Guide.pdf">https://idcwebstorage1.blob.core.windows.net/pdc-identocard-knowledgebase/EPI%20Suite/EPI_Suite_User_Guide.pdf</a>
2.	<a href="https://ir-library.ku.ac.ke/bitstream/handle/123456789/15298/Antimicrobial%20activity%20and%20qualitative%20phytochemical.pdf?sequence=1&amp;isAllowed=y">https://ir-library.ku.ac.ke/bitstream/handle/123456789/15298/Antimicrobial%20activity%20and%20qualitative%20phytochemical.pdf?sequence=1&amp;isAllowed=y</a>
3.	<a href="https://ncert.nic.in/textbook/pdf/lech205.pdf">https://ncert.nic.in/textbook/pdf/lech205.pdf</a>
<b>MOOC</b>	
1.	<a href="https://onlinecourses.nptel.ac.in/noc21_bt36/preview">https://onlinecourses.nptel.ac.in/noc21_bt36/preview</a>

COURSE TITLE	DESIGN THINKING FOR BIOTECHNOLOGISTS			CREDITS	2
COURSE CODE	EBT51402	COURSE CATEGORY	PC	L-T-P-S	0-1-2-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3
ASSESSMENT SCHEME					
First Periodical Assessment	Second Periodical Assessment	Weekly assignment/ Observation / lab records as approved by DEC	Surprise Test / Quiz as approved by DEC	Attendance	ESE
15%	15%	10%	5%	5%	50%
Course Description	This course will offer an immersive experience in Design Thinking as a tool for innovative idea and strategy development.				
Course Objective	<ol style="list-style-type: none"> <li>To provide insights into design thinking concepts and principles</li> <li>To use design thinking methods in every stage of the problem</li> <li>To understand the different phases of design thinking</li> <li>To apply various methods in design thinking to develop prototypes</li> <li>To study the steps involved in transferring a process/product to industry</li> </ol>				
Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> <li>Apply key concepts of design thinking</li> <li>Choose the stages of design thinking for problem solving</li> <li>Organize design thinking strategy to product/process development</li> <li>Prepare a prototype of the process/product and marketing strategies</li> <li>Demonstrate the prototype for industrial application</li> </ol>				

Prerequisites: NIL

**CO, PO AND PSO MAPPING**

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

1: Weakly related, 2: Moderately related and 3: Strongly related

**MODULE 1: INTRODUCTION TO DESIGN THINKING (3L+6P)**

Introduction to design. Phases of design thinking – Empathise, analyse, Solve, test. Empathize stage – Problem definition. 4Ws and 5 Whys approach. Design and its objectives; Design constraints, Phases of design thinking.

**Lab Component:**

An exercise to think of a design of a daily use product

**CO-1  
BTL-3**

**MODULE 2: DESIGN THINKING PROCESS (3L+6P)**

Design process- Different stages in design and their significance; Defining the design space; “thinking outside of the box”; Morphological chart. Design functions, Design specifications. Tools to establish design functions – black box and glass box, enumeration, reverse engineering, Function-means tree.

**Lab Component:**

An exercise to present alternative designs for a product

**CO-2  
BTL-3**

**MODULE 3: DESIGN STRATEGY (3L+6P)**

Designing in teams – C Sketch method, 6-3-5 method, gallery method. Testing and evaluation of design; Design modifications; Freezing the design; Cost analysis. Engineering the design - From prototype to product.

**Lab Component:**

An exercise to choose bioproduct and analyze its method of preparation

**CO-3  
BTL-3**

**MODULE 4: MARKETING THE DESIGN (3L+6P)**

Design to cover quality, reliability, safety, manufacturing/construction, assembly, maintenance, logistics, handling; disassembly; recycling; re-engineering etc. Packaging; shipping; marketing and feed-back on design.

**Lab Component:**

An exercise to promote and market the product/process developed

**CO-4  
BTL-3**

**MODULE 5: DESIGN IMPLEMENTATION (3L+6P)**

Product centered and user centered design. Reverse engineering in design; Design as a marketing tool; Intellectual Property rights - Trade secret; patent; copy-right; trademarks. Various Indian and global institutions for design thinking support.		<b>CO-5 BTL-3</b>
<b>Lab Component:</b> An exercise to articulate the developed process as a proposal to implement in an industry		
<b>TEXT BOOKS</b>		
1.	Kosky, p., Balmer, R., Keat, W., Wise, G. (2015). <i>Exploring Engineering: An Introduction to Engineering and Design</i> , Elsevier, 4 <sup>th</sup> Edition.	
2.	Liedtka, J., Ogilvie, T. (2016). <i>Designing for Growth: a design thinking tool kit for managers</i> , Columbia Business School Publishing, 2 <sup>nd</sup> Edition.	
3.	Clive, L., Dym, Little, P. (2013). <i>Engineering Design: A Project-based Introduction</i> . John Wiley, 4 <sup>th</sup> Edition.	
<b>REFERENCE BOOKS</b>		
1.	Schneider, J. (2017). <i>Understanding Design Thinking, Lean and Agile</i> , O'Reilly Media Publications, 4 <sup>th</sup> Edition.	
2.	Martin, R. (2018). <i>The Design of Business: Why Design Thinking is the Next Competitive Advantage</i> , Harvard Business Press, 2 <sup>nd</sup> Edition.	
3.	Brown, T. (2016). <i>Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation</i> , Harper Collins Publications, 1 <sup>st</sup> Edition.	
<b>E BOOKS</b>		
1	<a href="http://ajjuliani.com/design-thinking-activities/5">http://ajjuliani.com/design-thinking-activities/5</a> . <a href="https://venturewell.org/class-exercises">https://venturewell.org/class-exercises</a>	
2	<a href="https://www.researchgate.net/publication/329310644_Handbook_of_Design_Thinking/link2/5c3d987b299bf12be3c8b626/download">https://www.researchgate.net/publication/329310644_Handbook_of_Design_Thinking/link2/5c3d987b299bf12be3c8b626/download</a>	
<b>MOOC</b>		
1.	<a href="https://www.coursera.org/learn/uva-darden-design-thinking-innovation">https://www.coursera.org/learn/uva-darden-design-thinking-innovation</a>	

## SEMESTER – II

COURSE TITLE	ANALYTICAL MATHEMATICS (Common to ALL B. Tech)			CREDITS	4
COURSE CODE	EMA51002	COURSE CATEGORY	BS	L-T-P-S	3-0-2-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3
<b>ASSESSMENT SCHEME</b>					
CIA				ESE	
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / Lab records as approved by the Department Examination	Attendance	End Semester Examination (Theory)
					End Semester Examination

			Committee "DEC"			(Practical)
15%	15%	10%	5%	5%	25%	25%
<b>Course Description</b>	To make the student understand the basic analytical mathematical skills that is imperative for effective understanding of engineering subject using MATLAB.					
<b>Course Objective</b>	<ol style="list-style-type: none"> <li>To implement problem solving skills using vectors</li> <li>To provide an exposure on the concepts of complex variables, conformal mapping and bilinear transformation.</li> <li>To comprehend integrals using Cauchy's integral and residue theorem.</li> <li>To illustrate the applications of Laplace Transforms</li> <li>To make the students understand the concept of Fourier series</li> </ol>					
<b>Course Outcome</b>	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> <li>Verify the standard theorems in Vector Calculus and apply them to evaluate surface area and volume.</li> <li>Construct an analytic function when real and imaginary parts are given.</li> <li>Evaluate finite integrals using Cauchy's theorem.</li> <li>Solve the system of ordinary differential equations using Laplace Transform</li> <li>Expand the Fourier series for the given function.</li> </ol>					

**Prerequisites: Knowledge in single-variable calculus.**

#### CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO1	3	3	2	-	1	-	-	-	-	-	-	1	<b>To be marked by respective department</b>		
CO2	3	2	1	-	2	-	-	-	-	-	-	1			
CO3	3	2	1	2	1	-	-	-	-	-	-	1			
CO4	3	3	2	1	1	-	-	-	-	-	-	2			
CO5	3	3	2	-	1	-	-	-	-	-	-	2			

**1: Weakly related, 2: Moderately related and 3: Strongly related**

#### MODULE 1: VECTOR CALCULUS

**(9L+6P)**

Gradient, Divergence and Curl – Unit normal vector, Directional derivative – angle between surfaces- Irrotational and Solenoidal vector fields. Green's theorem - Gauss divergence theorem and Stoke's theorem (without proof) – Verification and evaluation of the above theorems - Simple applications to regions such as square, rectangle, triangle, cuboids and rectangular parallelepipeds.

Suggested Reading: Basics of Vectors

**Lab: Gradient, Divergence, Curl, Irrotational and Solenoidal vector fields**

**CO-1  
BTL-3**

<b>MODULE 2: COMPLEX VARIABLES</b>		<b>(9L+6P)</b>
<p>Functions of a complex variable – Analytic function - Cauchy - Riemann equations – Properties of analytic function (Statement Only) – Construction of Analytic functions by Milne – Thomson method – Conformal Mapping – Mapping by functions</p> <p><math>w = z + c, w = cz, w = 1/z</math>, Bilinear transformation.</p> <p>Suggested Reading: Complex Numbers</p> <p><b>Lab: Verification of Analytic Function</b></p>		<p><b>CO-2</b></p> <p><b>BTL-3</b></p>
<b>MODULE 3: COMPLEX INTEGRATION</b>		<b>(9L+6P)</b>
<p>Statement and Application of Cauchy’s Integral theorem and integral formula (without proof)-Evaluation of integrals using the above theorem-Taylor and Laurent series expansions-Singularities-Classification. Residues-Cauchy’s residue theorem (without proof)-Contour integration over unit circle and semi-circular contours (excluding poles on boundaries)</p> <p>Suggested Reading: Types of integration</p> <p><b>Lab: Evaluation of integrals using Cauchy’s Integral formula and Cauchy’s residue theorem.</b></p>		<p><b>CO-3</b></p> <p><b>BTL-3</b></p>
<b>MODULE 4: LAPLACE TRANSFORMS</b>		<b>(9L+6P)</b>
<p>Laplace transform – Conditions of existence – Transform of elementary functions – properties – Transforms of derivatives – Initial and final value theorems – Transform of periodic functions. Inverse Laplace transforms using partial fraction and convolution theorem. Solution of linear ODE of second order with constant coefficients.</p> <p>Suggested Reading: Basics of Transform</p> <p><b>Lab: Solutions of differential equations using Laplace transform</b></p>		<p><b>CO-4</b></p> <p><b>BTL-3</b></p>
<b>MODULE 5: FOURIER SERIES</b>		<b>(9L+6P)</b>
<p>Dirichlet’s Conditions – General Fourier Series – Odd and even functions – Half range sine and cosine series –Harmonic Analysis.</p> <p>Suggested Reading: Basics of series</p> <p><b>Lab: Finding Fourier Series</b></p>		<p><b>CO-5</b></p> <p><b>BTL-3</b></p>
<b>TEXT BOOKS</b>		
1.	A. Chandrasekaran, G. Kavitha (2022), <i>Analytical Mathematics</i> , Dhanam Publications, 1 <sup>st</sup> Edition, Chennai.	
2.	T. Veerarajan (2016), <i>Engineering Mathematics-II</i> , McGraw Hill Education (India), Private Limited, 4 <sup>th</sup> Edition, New Delhi.	
3.	Raj Kumar Bansal, Ashok Kumar Goel, Manoj Kumar Sharma (2016), <i>MATLAB and its Applications in Engineering</i> , Pearson Publication, 2 <sup>nd</sup> Edition, New Delhi.	
4.	D. G. Duffy (2021), <i>Advanced Engineering Mathematics With MATLAB (Advances in Applied Mathematics)</i> , Chapman and Hall Publisher, 5 <sup>th</sup> Edition, CRC Press, USA.	
<b>REFERENCE BOOKS</b>		
1.	P. Sivarama Krishna Das, C. Vijayakumari (2017), <i>Engineering Mathematics</i> , 1 <sup>st</sup> Edition, Pearson Publishing, Chennai.	
2.	A. P. Santhakumaran, P. Titus P (2017), <i>Engineering Mathematics – II</i> , NiMeric Publications,	



	2 <sup>nd</sup> Edition, Nagercoil, India.
3.	Kreyszig Erwin (2016) <i>Advanced Engineering Mathematics</i> , John Wiley and Sons, 10 <sup>th</sup> Edition, New Delhi.
4.	S.S. Sastry (2015), <i>Engineering Mathematics</i> , Vol. I & II, PHI Learning Pvt. Ltd, 4 <sup>th</sup> Edition, New Delhi.
<b>E BOOKS</b>	
1.	<a href="http://ggn.dronacharya.info/APSDept/Downloads/QuestionBank/Mathematics-I/SectionD.pdf">http://ggn.dronacharya.info/APSDept/Downloads/QuestionBank/Mathematics-I/SectionD.pdf</a> .
2.	
3.	<a href="https://people.math.sc.edu/girardi/m7034/book/AshComplexVariablesWithHyperlinks.pdf">https://people.math.sc.edu/girardi/m7034/book/AshComplexVariablesWithHyperlinks.pdf</a>
4.	<a href="https://ocw.mit.edu/courses/18-03sc-differential-equations-fall-2011/pages/unit-iii-fourier-series-and-laplace-transform/">https://ocw.mit.edu/courses/18-03sc-differential-equations-fall-2011/pages/unit-iii-fourier-series-and-laplace-transform/</a> <a href="https://www.pdfdrive.com/calculus-ii-sequences-and-series-e11676778.html">https://www.pdfdrive.com/calculus-ii-sequences-and-series-e11676778.html</a>
<b>MOOC</b>	
1.	<a href="https://www.edx.org/course/introduction-engineering-mathematics-utarlingtonx-engr3-0x">https://www.edx.org/course/introduction-engineering-mathematics-utarlingtonx-engr3-0x</a>

COURSE TITLE	ENGINEERING MATERIALS (Common to ALL Branches of Engineering)			CREDITS	4
COURSE CODE	ECT51001	COURSE CATEGORY	BS	L-T-P-S	3-0-2-2
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3
<b>ASSESSMENT SCHEME</b>					
First Periodical Assessment	Second Periodical Assessment	Practical			ESE
15%	15%	20%			50%
Course Description	To expose the students to the basics of Engineering Materials and their applications.				
Course Objective	<ol style="list-style-type: none"> <li>1. To make the students understand the basics of crystal structure and phase rule.</li> <li>2. To provide a knowledge on the theoretical basis of the chemical composition, properties and applications of abrasives, adhesives, lubricants and refractories.</li> <li>3. To give a strong foundation on the basic concepts of nanomaterials, the general synthetic methods with emphasis on their applications.</li> <li>4. To provide an exposure on the fundamentals and applications of polymeric materials and composites.</li> <li>5. To illustrate the applications of energy materials, liquid crystals and conducting polymers with a good exposure on their basic terminologies.</li> </ol>				

<b>Course Outcome</b>	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> <li>Propose and justify suitable metals/materials for alloying.</li> <li>Distinguish and select a suitable material as abrasives / adhesives / lubricants / refractories based on its properties and applications.</li> <li>Select an appropriate technique for nanomaterial synthesis and characterization.</li> <li>State and select a suitable polymeric / composite material for industrial applications.</li> <li>Identify the suitable organic/inorganic materials which can be employed in energy storage / production and electronic devices.</li> </ol>
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**Prerequisites: Knowledge in fundamentals of chemistry at higher secondary level.**

**CO, PO AND PSO MAPPING**

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3	2	1	-	-	-	1	-	-	-	-	1	To be marked by respective department		
CO-2	3	2	1	-	-	-	2	-	-	-	-	2			
CO-3	3	2	1	-	-	-	2	-	-	-	-	2			
CO-4	3	2	1	-	-	-	2	-	-	-	-	2			
CO-5	3	2	1	-	-	-	2	-	-	-	-	2			

**1: Weakly related, 2: Moderately related and 3: Strongly related**

**MODULE 1: CRYSTAL STRUCTURE AND PHASE RULE**

**(9L + 6P)**

Basic crystal systems – Types, characteristics, examples – Space lattice, Unit cell – types – X-ray diffraction and crystal structure.  
 Phase rule: Basic terminology - Derivation of Gibbs Phase rule- Phase diagrams: One component system (water), Two component system – Reduced phase rule: Simple Eutectic system, examples, Phase diagram: Ag-Pb system, Pb-Sn system – Applications of phase rule.

**Practical component:** Construction of phenol-water phase diagram - Determination of apparent density of porous solids.

**CO-1  
BTL-3**

**MODULE 2: ABRASIVES, ADHESIVES, LUBRICANTS AND REFRACTORIES**

**(9L + 6P)**

Abrasives – Classification, Properties, Uses – Adhesives – Development of Adhesive strength, Physical and Chemical factors influencing adhesive action, Classification of Adhesives – Epoxy Resin (Preparation, Properties and Applications) – Lubricants – Mechanism of Lubrication, Classification and Properties, Semi Solid Lubricants, Solid Lubricants, MoS<sub>2</sub> and Graphite - Refractories – Classification, Properties, Applications.

**Practical components:** Preparation of urea-formaldehyde resin - Determination of porosity of a refractory.

**CO-2  
BTL-3**

**MODULE 3: NANOMATERIALS**

**(9L + 6P)**

Introduction – Scope of nanomaterials - Types of nanomaterials - Synthesis of Nanomaterials - Bottom-up and Top-down approaches – Methods of preparation – Laser ablation, Sol-gel process, Gas-phase condensation, Chemical Vapour Deposition. Properties – Optical, Electrical, Magnetic, Chemical properties (introduction only). Characterization – UV-Visible spectroscopy, FE-SEM and TEM (Principle and Applications only).		<b>CO-3</b> <b>BTL-3</b>
<b>Practical component:</b> Preparation of ZnO nanoparticles by wet chemical method – Verification of Beer-Lambert’s law using silver nanoparticles.		
<b>MODULE 4: POLYMERS AND COMPOSITES</b>		<b>(9L + 6P)</b>
Introduction – Basic definitions – Classification of polymers – Structure and property relationship of polymers – Plastics – Synthesis, properties and applications of polycarbonates and phenol-formaldehyde - Biodegradable Polymers, examples and applications. Composites - Introduction - Definition – Constituents – Classification - Fiber-reinforced Composites –Types and Applications.		<b>CO-4</b> <b>BTL-3</b>
Practical components: Determination of molecular weight / viscosity of polymer using Ostwald Viscometer.		
<b>MODULE 5: MATERIALS FOR ENERGY AND ELECTRONIC APPLICATIONS</b>		<b>(9L + 6P)</b>
Energy storage materials – Metal-hydride batteries, Li-batteries - Materials for solar cells: Semi-conductors - Materials for hydrogen technology - production (electrolysis), storage (hydrides), fuel cells. Liquid Crystals - Introduction –Characteristics – Optical properties- Classification – Chemical constitution and liquid crystalline behavior - Applications. Conducting Polymers: Classification, Intrinsic Conducting Polymers, Extrinsic Conducting Polymers, applications.		<b>CO-5</b> <b>BTL-3</b>
Practical component: Preparation of polyaniline / Polypyrrole.		
<b>TEXT BOOKS</b>		
1.	Jain, P.C., Jain, M. (2015). <i>Engineering Chemistry</i> , Dhanpat Raj Publishing Company (P) Ltd, New Delhi, 16 <sup>th</sup> Edition.	
2.	Puri, B. R., Sharma, L. R., Pathania, M. S. (2020). <i>Principles of Physical Chemistry</i> , Vishal Publishing Co. Jalandhar, 47 <sup>th</sup> Edition.	
3.	Rangwala. (2017). <i>Engineering Materials</i> , Charotar Publishing House Pvt. Ltd, 43 <sup>rd</sup> Edition.	
<b>REFERENCE BOOKS</b>		
1	Clyne, T. W., Hull, D. (2019). <i>An introduction to composite materials</i> , Cambridge University Press, 3 <sup>rd</sup> Edition.	
2	Shah, M. A., Ahmad, T. (2021). <i>Nano Science &amp; Technology</i> , Dreamtech Press, 2021 Edition.	
3	Palanna, O. G. (2018). <i>Engineering Chemistry</i> , Mc Graw Hill Education (India) Pvt. Ltd, 2 <sup>nd</sup> Edition.	
<b>E BOOKS</b>		
1.	<a href="http://www.erforum.net/2016/01/engineering-chemistry-by-jain-and-jain-pdf-free-ebook.html">http://www.erforum.net/2016/01/engineering-chemistry-by-jain-and-jain-pdf-free-ebook.html</a>	

2.	<a href="https://abmpk.files.wordpress.com/2014/02/book_maretial-science-callister.pdf">https://abmpk.files.wordpress.com/2014/02/book_maretial-science-callister.pdf</a>
<b>MOOC</b>	
1	<a href="https://www.edx.org/course/materials-science-engineering-misisx-mse1x">https://www.edx.org/course/materials-science-engineering-misisx-mse1x</a>
2	<a href="https://www.mooc-list.com/tags/materials-science">https://www.mooc-list.com/tags/materials-science</a>

<b>COURSE TITLE</b>	<b>CELL BIOTECHNOLOGY</b>			<b>CREDITS</b>	<b>4</b>
<b>COURSE CODE</b>	<b>EBT51002</b>	<b>COURSE CATEGORY</b>	<b>PC</b>	<b>L-T-P-S</b>	<b>2-1-2-1</b>
<b>Version</b>	<b>1.0</b>	<b>Approval Details</b>		<b>LEARNING LEVEL</b>	<b>BTL-3</b>

<b>ASSESSMENT SCHEME</b>					
<b>First Periodical Assessment (Theory + Practical)</b>	<b>Seconds Periodical Assessment (Theory + Practical)</b>	<b>Weekly assignment/ Observation / lab records as approved by DEC</b>	<b>Surprise Test / Quiz as approved by DEC</b>	<b>Attendance</b>	<b>ESE (Theory + Practical)</b>
<b>15%</b>	<b>15%</b>	<b>10%</b>	<b>5%</b>	<b>5%</b>	<b>50%</b>

<b>Course Description</b>	Cell Biotechnology course deals with the biology of cells of higher organisms. The structure, function, and biosynthesis of cellular membranes and organelles; cell growth and oncogenic transformation; transport, receptors, and cell signaling; cytoskeleton, extracellular matrix, and cell movements; chromatin structure and RNA synthesis.
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<b>Course Objective</b>	<ol style="list-style-type: none"> <li>1. To gain basic knowledge about different types of cells and organelles found therein</li> <li>2. To identify different transport mechanisms across the cell membranes</li> <li>3. To apply extensive knowledge about cell signaling pathways</li> <li>4. To study different cell culture techniques</li> <li>5. To demonstrate the process of differentiation of stem cells and familiarize with the molecular and cellular basis of occurrence of cancer cells</li> </ol>
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<b>Course Outcome</b>	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> <li>1. Organize the structures of bacterial, plant and animal cells and organelles in eukaryotic cells</li> <li>2. Choose the transport mechanisms either active or passive depends of molecules across the cell membranes</li> <li>3. Apply knowledge on intracellular and extracellular receptors, and understand their role in signal transduction</li> <li>4. Prepare nutrient media and grow bacterial and yeast cell cultures</li> <li>5. Demonstrate the differentiation of stem cells from embryonic to adult stem cells, and development of cancer cells</li> </ol>
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**Prerequisites: Basics of biology**

**CO, PO AND PSO MAPPING**

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PS O-1	PS O-2	PSO-3
CO-1	1	1	1	-	1	1	-	1	1	-	1	-	3	1	1
CO-2	-	2	1	1	-	1	1	-	2	1	-	1	3	-	-
CO-3	2	3	2	2	-	1	1	-	2	-	1	1	3	-	-
CO-4	1	3	3	3	1	3	2	3	3	1	-	1	3	2	2
CO-5	-	1	3	3	-	3	2	3	2	1	2	1	3	3	1
<b>1: Weakly related, 2: Moderately related and 3: Strongly related</b>															
<b>MODULE 1: Overview of the Cells</b>													<b>(6L+3T+6P)</b>		
Introduction to cells, types, structure; Eukaryotic cells - organelles and other cellular components principles of membrane organization; Extra cellular matrix; Membrane proteins, cytoskeletal proteins; Cell cycle – Preparation phase and mitotic phase; Types of cell division - mitosis & meiosis <b>Lab component:</b> Aseptic conditions for the growth of cell; cell culture media preparation													<b>CO-1 BTL-3</b>		
<b>MODULE 2: Transport across Cell Membranes</b>													<b>(6L+3T+6P)</b>		
Membrane transporter proteins and types. Passive & active transport, Passive-permeases, diffusion, osmosis; Active-sodium potassium pump, Ca <sup>2+</sup> ATPase pumps, ATP dependent proton pumps; Symport, uniport & antiport; Endocytosis - pinocytosis, phagocytosis and receptor-mediated endocytosis, and exocytosis; Entry of viruses into cells. <b>Lab component:</b> Principles of microscopy; buccal smear preparation and visualisation, mitotic division in onion root tip													<b>CO-2 BTL-3</b>		
<b>MODULE 3: Cell Receptors and Signal Transduction</b>													<b>(6L+3T+6P)</b>		
Cell surface receptors – structure, domains and signal transduction; Signalling molecules and their receptors-Intracellular and extracellular receptors – Enzyme linked receptor, Ligand gated ion channel, GPCR; Cell signalling – paracrine, autocrine, endocrine, direct interaction in action; Secondary messengers – calcium ions, cAMP, cGMP. <b>Lab component:</b> Gram staining on bacteria, staining methods for identification of cells in blood													<b>CO-3 BTL-3</b>		
<b>MODULE 4: Cell culture</b>													<b>(6L+3T+6P)</b>		
Cell culture & growth curve– bacteria, yeast, insect cells & mammalian cells. Primary cell culture, subculture; Characterization of cells: morphological analysis; Eukaryotic cell lines; Cell division, differentiation, proliferation; Three dimensional cultures, 2D Vs 3D cell culture. <b>Lab component:</b> Cell culture growth – bacteria and yeast, cell separation method													<b>CO-4 BTL-3</b>		
<b>MODULE 5: Stem cells and Cancer cells</b>													<b>(6L+3T+6P)</b>		
Stem cells, Differentiation of stem cells– embryonic stem cells and adult stem cells-sources of stem cells, stem cells treatment; Cancer cells – cancer cell development – benign tumour, malignant tumour; Causes of cancer, treatments for cancer. <b>Lab component:</b> Cell disruption methods – reagent based, physical methods													<b>CO-5 BTL-3</b>		

TEXT BOOKS	
1.	Darnell, J., Lodish, H., Baltimore, D. (2016). <i>Molecular Cell Biology</i> , Macmillan Learning, 4 <sup>th</sup> edition.
2.	Slack J. M. W (2018). <i>The Science of Stem Cells</i> , Wiley Blackwell, 1 <sup>st</sup> edition.
3.	Karp G, Iwasa J, Marshall W (2018). <i>Karp's Cell Biology</i> , Wiley Global Edition, 8 <sup>th</sup> edition.
REFERENCE BOOKS	
1.	Robertis, D., Robertis, D. (2017). <i>Cell and Molecular Biology</i> , Lippincott Williams and Wilkims, 8 <sup>th</sup> Edition.
2.	Alberts, B. (2017). <i>Molecular Biology of the Cell</i> , Garland Science, 4 <sup>th</sup> Edition.
E BOOKS	
1.	<a href="https://drive.google.com/file/d/1suIOrwUrm6XpplxzXhIVGY2rHMU0gaFk/view?usp=share_link">https://drive.google.com/file/d/1suIOrwUrm6XpplxzXhIVGY2rHMU0gaFk/view?usp=share_link</a>
2.	<a href="https://books.google.co.in/books?isbn=0323400027">https://books.google.co.in/books?isbn=0323400027</a>
MOOC	
1.	<a href="https://onlinecourses.nptel.ac.in/noc22_bt18/preview">https://onlinecourses.nptel.ac.in/noc22_bt18/preview</a>

COURSE TITLE	UNIVERSAL HUMAN VALUES			CREDITS	2
COURSE CODE	EGE51001	COURSE CATEGORY		L-T-P-S	2-0-0-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3
ASSESSMENT SCHEME					
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%
Course Description	This course is mandatory as per the AICTE for the UG students to motivate the students for focusing on the human values. The main aim is to focus on the sustainability of happiness with harmony and natural acceptance in the career. Lecture cum power points are provided as guidelines from AICTE.				
Course Objective	<ol style="list-style-type: none"> <li>To create awareness to students on themselves and their surroundings (family, society, nature).</li> <li>To create responsibility among students on life in handling problems with sustainable solutions</li> <li>To prepare the students with human relationships and human nature in mind.</li> <li>To Prepare the students on critical ability and sensitive to their commitment.(human values, human relationship and human society).</li> <li>To apply the learning to their real life.</li> </ol>				

<b>Course Outcome</b>	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> <li>1. Demonstrate the necessity of relationship with family, society and nature. Familiarize with the challenges ahead and proposed solutions.</li> <li>2. Formulate and design human cyber security policies, plans and procedures for organizations.</li> <li>3. Apply standard security countermeasure tools to sustain human relationships and nature.es.</li> <li>4. Recognize the necessity of human values and relationship.</li> <li>5. Demonstrate the learning in their real life.</li> </ol>
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**Prerequisites: CSB231 - Cryptography and Network Security**

**CO, PO AND PSO MAPPING**

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

**1: Weakly related, 2: Moderately related and 3: Strongly related**

**MODULE 1: Introduction**

**3L+6L=9**

Need, Basic Guidelines, Content and Process for value Education purpose and motivation for the course, recapitulation from Universal Human Values-I Self-Exploration–what is it? - Its content and process; ‘Natural Acceptance’ and experiential Validation- as the process for self-exploration

Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

**Practical component:**

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

**Suggested Readings:**

Evolution of cyber security

**CO-1  
BTL-2**

**MODULE 2: Understanding Harmony in the Human Being**

**(3L+6L=9)**

<p>Harmony in Myself! Understanding human being as a co-existence of the sentient 'I' and the material 'Body' Understanding the needs of Self ('I') and 'Body' - happiness and physical facility Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) Understanding the characteristics and activities of 'I' and harmony in 'I' Understanding the harmony of I with the Body: <i>Sanyam</i> and Health; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure <i>Sanyam</i> and Health.</p> <p><b>Practical component:</b> Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs. dealing with disease</p>	<p><b>CO-2</b> <b>BTL-2</b></p>
<p><b>MODULE 3: Understanding Harmony in the Family and Society (3L+6L=9)</b></p>	
<p>Harmony in Human-Human Relationship Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship Understanding the meaning of Trust; Difference between intention and competence Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals</p> <p><b>Practical component:</b> Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives</p>	<p><b>CO-3</b> <b>BTL-3</b></p>
<p><b>MODULE 4: Understanding Harmony in the Nature and Existence (3L+6L=9)</b></p>	
<p>Whole existence as Coexistence - Understanding the harmony in the Nature - Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature -Understanding Existence as Co-existence of mutually interacting units in all-pervasive space -Holistic perception of harmony at all levels of existence.</p> <p><b>Practical component:</b> Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.</p>	<p><b>CO-4</b> <b>BTL-2</b></p>
<p><b>MODULE 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics (3L+6L=9)</b></p>	



<p>Natural acceptance of human values, Definitiveness of Ethical Human Conduct Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order - Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. - Case studies of typical holistic technologies, management models and production systems-Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations. Sum up.</p> <p><b>Practical component:</b></p> <p>Include practice exercises and case studies to discuss the conduct as an engineer or scientist etc.</p>	<p><b>CO-5</b> <b>BTL-2</b></p>
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**TEXT BOOKS**

1. P.R Gaur, R Asthana, G.P Bagaria, Human Values and Professional Ethics (2<sup>nd</sup> revised edition) Excel Books, New Delhi, 2019
2. A Nagaraj, Jeevan Vidya: Ek Parichaya, Jeevan Vidya Prakashan, Amarkantak, 1999.
3. A. N Tripathi, Human Values, New Age Intl. Publishers, New Delhi, 2004.

Lawrence, C. (2016). *Cyber security for Dummies*, John Wiley & Sons Inc., 2<sup>nd</sup> Edition, pp.213--432.

**REFERENCE BOOKS**

1.	AICTE STUDENT INDUCTION PROGRAM HANDBOOK - <a href="https://fdp-si.aicte-india.org/download/Guidelines/G012%20SIP%20Hand%20Book%20v2.pdf">https://fdp-si.aicte-india.org/download/Guidelines/G012%20SIP%20Hand%20Book%20v2.pdf</a>
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**E BOOKS**

1.	<a href="https://fdp-si.aicte-india.org/download.php#1">https://fdp-si.aicte-india.org/download.php#1</a>
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COURSE TITLE		Communication Skills			CREDITS	3
COURSE CODE		ELS51001	COURSE CATEGORY	HS	L - T - P - S	2 - 0 - 2 - 1
Version	1.0	Approval Details	35 <sup>th</sup> ACM - 6 <sup>th</sup> Aug. 2022		LEARNING LEVEL	BTL 4

**ASSESSMENT SCHEME**

First Periodical Assessment	Second Periodical Assessment	Weekly assignment/ lab record and viva as approved by the Department Examination Committee	Surprise Test / Quiz., as approved by the Department Examination Committee "DEC"	Attendance	End Semester Examination (ESE) Theory + Practical
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		<b>"DEC"</b>			
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<b>15 %</b>	<b>15%</b>	<b>10 %</b>	<b>5 %</b>	<b>5 %</b>	<b>50%</b>
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<b>Course Description</b>	The course has been designed to improve the communication competency of the students. The course builds on students' English language skills by engaging them in listening, speaking and grammar learning activities (LSRW) that are relevant to authentic contexts. This course trains the students how to communicate accurately, appropriately and fluently in professional and social situations. The course is framed so that the students can appear for Cambridge B1 Preliminary exams and also enable them to get a certification.
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<b>Course Objective</b>	<ol style="list-style-type: none"> <li>To acquire self-confidence by which the learner can improve upon their informative listening skills by an enhanced acquisition of the English language.</li> <li>To provide an environment to Speak in English at the formal and informal levels and use it for daily conversation, presentation, group discussion and debate.</li> <li>To equip the students to Read, comprehend and answer questions based on literary, scientific and technological texts.</li> <li>To enhance the writing skills of the students via training in instructions, recommendations, checklists, process-description, letter-writing and report writing.</li> <li>To equip the learners in analyzing and applying creative thinking skills and participate in brainstorming, mind-mapping, audiovisual activities and excel in employability skills.</li> </ol>
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<b>Course Outcome</b>	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> <li>Acquire the accuracy through the knowledge of Syntax.</li> <li>Demonstrate the skill of using the vocabulary and use it in sentences appropriately.</li> <li>Infer texts and improvise its usage.</li> <li>Illustrate language acquisition skills through formal correspondence.</li> <li>Analyse and transcode the data and interpret it in text format.</li> </ol>
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**Prerequisites:** Plus Two English-Intermediate Level

**CO AND PO MAPPING**

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PSO 3
CO1	-	-	-	-	-	-	-	-	-	3	-	2	<b>To be marked by respective department</b>		
CO2	-	-	-	-	-	-	-	-	-	3	-	2			
CO3	-	-	-	-	-	-	-	2	-	3	-	2			
CO4	-	-	-	-	-	-	-	2	2	3	2	2			
CO5	-	-	-	-	-	-	-	-	-	3	3	2			

**1: Weakly related, 2: Moderately related and 3: Strongly related**

<b>MODULE 1 : English for Employability</b>	<b>(6L + 6P = 12)</b>
<p><b>Grammar</b> : 1. Parts of Speech – Identification and Transformation 2. Kinds of Sentences – Identification and Transformation 3. Sentence Pattern – Framing Sentences 4. Tenses – Rules &amp; its usage – Present simple and present continuous; time expressions; state verbs – Past simple ; regular and irregular verbs and spelling of past simple forms ; past continuous.</p> <p><b>Vocabulary</b> : 1. Job titles and describing jobs ; names of company departments 2. Computer terms; email and website terms. 3. Headings for CVs Describing application Procedures</p> <p><b>Writing</b> : 1. Writing emails – formal and informal – phrases for emails &amp; letters. 2. Writing a covering letter with a resume for a job application.</p> <p><b>Reading</b> : Reading about Job and Company : 1. Changing places : job swapping at work. 2. The power of word of mouse : an article on the power of online customer options 3. Haier : an article about the history of a Chinese Company. 4. What kind of company Culture would suit you ? reading answering a quiz.</p> <p><b>Lab Activities(Speaking)</b> : 1. Self Introduction. 2. Describing jobs ; asking other people about their jobs. 3. Asking about the history of a company ; past simple questions 4. Asking questions about companies and jobs.</p> <p><b>Lab Activities(Listening)</b> : 1. Being a PA 2. Growing Pains : an interview with a business consultant about company’s Growth. 3. Describing changes in a company : a Conversation on the phone.</p>	<b>CO-1</b> <b>BTL-2</b>
<b>MODULE 2 : English for Marketing</b>	<b>(6L + 6P = 12)</b>
<p><b>Grammar</b>: 1. Concord - Understanding Subject Verb agreement – Identifying the error and Correcting 2. Active and Passive Voice – Identifying the voices and Transforming Active to passive and passive to active 3. Modal Verbs – Using to express modalities – in active and passive voices 4. Words to Describe causes and effects. 5. Prepositions</p> <p><b>Vocabulary</b> : 1. Vocabulary to describe objects; component parts, shapes, dimensions, materials Describing problems with equipment 2. Verbs to Describe process 3. Vocabulary to talk about advertising and marketing, Language to describe cause and effect.</p> <p><b>Writing</b> : 1. Topic Sentence 2. Paragraph Writing 3. Developing a story with the hints 4. Promotional letter(Email)</p> <p><b>Reading</b> : Product Description and Advertisement : 1. Problems with equipment : emails and headings on a form. 2. Waratah : an article on an Australian clothing company. , Short Texts : Notices, Notes and messages 3. Selling your product abroad; an article , Workplace signs and notices 4. Descriptions of advertising media, Singapore airlines; an article on the branding of an airline.</p> <p><b>Lab Activities(Speaking)</b> : 1. Role Play – Telephone call to a supplier, 2. Describing Objects</p> <p><b>Lab Activities(Listening)</b> : 1. Describing dimensions of products : Conversations with colleagues and suppliers. – The Gizmo game : listening to the uses of a gadget. 2. Channel No.5 : an interview about a production process 3. Telephone conversations : information about orders and deliveries. 4. Descriptions of how a product is advertised.</p>	<b>CO-2</b> <b>BTL-3</b>
<b>MODULE 3 : Business Correspondence</b>	<b>(6L + 6P = 12)</b>
<p><b>Grammar</b> : 1. Tenses – Present continuous for future arrangements; will and going to future forms 2. Using discourse markers ; Sentence starters - Contrast &amp; similarity words, 3. Degrees of Comparison – Framing sentences with appropriate adjectives and adverbs – transformation from one degree to another degree. 4. Infinitives and gerunds – using</p>	<b>CO-3</b> <b>BTL-3</b>

<p>infinitives and gerunds in sentences as different elements. 5. Conditionals – Three types of conditionals.</p> <p><b>Vocabulary</b> : 1.Vocabulary for travel 2. Synonyms and Antonyms 3. Employment Vocabulary</p> <p><b>Writing</b> : 1. A letter(Email) of invitation – Accepting the invitation and declining the invitation.</p> <p><b>Reading</b> : Transport, Working Holidays and Conferences : Travel Arrangements : notices and short messages : Eurostar : an article on train travel. 2. Netflix : an article about a company’s holiday policy; thinking outside the box: an article on offsite meetings 3. Short Texts : Feedback on conferences</p> <p><b>Lab Activities(Speaking)</b> : Discussion: How to make decisions</p> <p><b>Lab Activities(Listening)</b> : 1. Making and changing appointments : Voicemail messages and phone conversations ; Future intentions and predictions : Short Extracts. 2. A travel Anecdote 3. Half Holidays: a conversations between two employees. 4. Discussing possible venues for a conference : a conversation between colleagues; a welcome speech at a conference.</p>	
<p><b>MODULE 4 : English for Business Relationships (6L + 6P = 12)</b></p>	
<p><b>Grammar</b> : 1. Writing Instructions and Recommendations – Transforming instruction to recommendation and recommendation to instruction 2. Expressions of quantity – semi-negative words 3. Present Perfect : time expressions : present perfect versus Past simple. 4. Reported Speech – Direct and Indirect Speeches – Identification and Transformation</p> <p><b>Vocabulary</b> : 1. Affixes 2. Countable and Uncountable nouns 3. Global Management</p> <p><b>Writing</b> : 1.Memo 2. Notice with agenda 3. Email : Requesting information</p> <p><b>Reading</b> : Corporate gift-giving, New places, New people, Team Building and Thinking globally : 1. Career Advice : letters to an advice column 2. Promotional gifts : an article 3. Descriptions of team building events; Kaizen : an article 4. Global HR management : an Article.</p> <p><b>Lab Activities(Speaking)</b>: Role Play : 1. Interviewing someone about a job change 2. Discussion : Planning a team building event 3. Promoting a city : giving a speech.</p> <p><b>Lab Activities(Listening)</b> : 1. An interview with someone who has changed career 2. An interview about corporate gift giving 3. Creating good teams : a Presentation 4. Working an international Team : short Extracts.</p>	<p><b>CO-4 BTL-3</b></p>
<p><b>MODULE 5 : English for Presentation (6L + 6P=12)</b></p>	
<p><b>Grammar</b> : 1. Adjectives and adverbs 2. Pronouns and Reference Words 3. Types of Sentences – Simple, Compound and complex Sentences – Identification and transformation.</p> <p><b>Vocabulary</b> : 1. Describing Trends 2. Finance Vocabulary 3. Stocks and Shares 4. Collocation - sets and money</p> <p><b>Writing</b> : 1. Transcoding – Converting an image (Linegraph, piechart, bar chart, flowchart tree diagram etc., ) into a paragraph – Converting a paragraph into an image(Linegraph, piechart, bar chart, flowchart tree diagram etc., ) 2. Summary writing</p> <p><b>Reading</b> : Describing Statistics, Company finances, investments and starting up : 1. Interpreting bar charts 2. Café Coffee day : an article on the growth of the Indian coffee shop. 3. Shares and the stock exchange: a web page; short articles from the financial news; men and women investments : an article 4. Teenage entrepreneurs : reading and comparing two articles; Kalido: an article on funding.</p>	<p><b>CO-5 BTL-4</b></p>

<b>Lab Activities(Speaking)</b> : 1. Describing figures and trends 2. Discussing qualities needed in candidates for a job vacancy	
<b>Lab Activities(Listening)</b> : 1. Listening to statistical information : short extracts 2. An interview with the employee of a company that helps failing business 3. An interview with someone who works in investor relations. 4. Radio interview : marketing director of a business support service.	
<b>TEXT BOOK</b>	
1	Whitby, Norman (2019). Cambridge English Business Benchmark, Pre-intermediate and Intermediate. Cambridge University Press. India (Pages 208)
<b>REFERENCE BOOKS</b>	
1.	Murphy, Raymond(2021). Essential English Grammar, Cambridge University Press.
2.	Redman, Stuart(2020).English Vocabulary In Use: Pre - Intermediate And Intermediate. Cambridge University Press. India (Pages 264)
3.	Bikram K. Das. et al.,(2019) An Introduction to Professional English and Soft Skills with audio CD, Cambridge University Press. India (Pages 272)
4.	John, Dolly., (2018), English for Life and the Workplace Through LSRW&T Skills, Pearson Publications. India (Pages 263)
<b>E BOOKS</b>	
1.	<a href="https://www.cambridge.org/gb/files/9116/4138/4615/A1_Student_Book.pdf">https://www.cambridge.org/gb/files/9116/4138/4615/A1_Student_Book.pdf</a>
2.	<a href="https://www.cambridge.org/gb/files/1416/4138/4681/A1_Workbook.pdf">https://www.cambridge.org/gb/files/1416/4138/4681/A1_Workbook.pdf</a>
3.	<a href="https://www.cambridge.org/gb/files/7216/4138/1999/A2_Student_Book.pdf">https://www.cambridge.org/gb/files/7216/4138/1999/A2_Student_Book.pdf</a>
4.	<a href="https://www.cambridge.org/gb/files/6816/4138/2072/A2_Workbook.pdf">https://www.cambridge.org/gb/files/6816/4138/2072/A2_Workbook.pdf</a>
<b>MOOC</b>	
1.	<a href="https://www.edx.org/professional-certificate/tsinghuax-english-communication-skills">https://www.edx.org/professional-certificate/tsinghuax-english-communication-skills</a>
2.	<a href="https://www.britishcouncil.org/tr/en/english/mooc/english-for-the-workplace">https://www.britishcouncil.org/tr/en/english/mooc/english-for-the-workplace</a>

COURSE TITLE	INNOVATION LAB FOR BIOTECHNOLOGISTS			CREDITS	2
COURSE CODE	EBT51401	COURSE CATEGORY	ES	L-T-P-S	0-1-2-2
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3
<b>ASSESSMENT SCHEME</b>					
First Periodical Assessment	Second Periodical Assessment	Weekly assignment/ Observation / lab records as approved by DEC	Surprise Test / Quiz as approved by DEC	Attendance	ESE
15%	15%	10%	5%	5%	50%

<b>Course Description</b>	An innovation lab is a new kind of physical space that encourages the creation, development, and implementation of novel ideas.
<b>Course Objective</b>	The students will be able 1. To study a new method for improving the experimental performance 2. To perform the life cycle assessment of any product from its origin to disposal 3. To ascertain effectively how to perceive things in a design engineering perspective 4. To evaluate the performance of biological treatment methods 5. To estimate cost and identify methods to scale up the proposed method/process to an industry
<b>Course Outcome</b>	After successful completion of innovation lab, the student will be able to 1. Produce an idea to develop new method to improve the performance of a product/process. 2. Organize life cycle assessment for any product or process. 3. Choose the design engineering principles based on the application 4. Demonstrate efficiency of biological treatment methods 5. Apply and develop entrepreneurship skills by scaling up the process/product developed

**Prerequisites: N/A**

**CO, PO AND PSO MAPPING**

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

**1: Weakly related, 2: Moderately related and 3: Strongly related**

**MODULE 1: INNOVATIVE THINKING**

**(3L+6P)**

Innovation methodology; Creation of ideas: new ideas generation and presentation. Exploring various possibilities of design and principles; Technical Report writing, Data collection and generation of charts with excel.

**Lab component:**

PowerPoint presentation of a novel product design/process design and ANOVA analysis

**CO-1  
BTL-3**

**MODULE 2: LIFE CYCLE ASSESSMENT**

**(3L+6P)**

Life Cycle Assessment – Introduction; Goal and Scope; Inventory analysis; Impact Assessment; Interpretation; Life cycle assessment of Bio products; Experiments and case studies to propose an innovative solution.

**Lab component:**

Life cycle assessment of a product.

**CO-2  
BTL-3**

**MODULE 3: DESIGNING OF BIOPROCESSES**

**(3L+6P)**

Introduction to bioreactors; Description of each component of a bioreactor; Application of bioreactors for development of enzymes; Laboratory demo of a bioreactor; Optimization methods to improve the design and performance of bioreactors. <b>Lab component:</b> Estimating and analysing the biodegradability using EPI Suite 4.0 software.	<b>CO-3</b> <b>BTL-3</b>
<b>MODULE 4: WASTEWATER TREATMENT (3L+6P)</b>	
Types, Principle and Applications of wastewater treatment; Introduction to biological methods of wastewater treatment; Treatment of domestic sewage and industrial effluents; Pros and cons of different wastewater treatment methods <b>Lab component:</b> Physical and chemical characterization of wastewater, adsorption studies, isolation and identification of microbial strains from waste	<b>CO-4</b> <b>BTL-3</b>
<b>MODULE 5: INNOVATIONS TO INDUSTRY (3L+6P)</b>	
Creating ideas and innovative products; Testing; prototype development. Lab to pilot scale; Process and economic analysis; Entrepreneurship; Industrial innovations. Case studies and examples. <b>Lab component:</b> Analysing the cost incurred to implement a process to an industry	<b>CO-5</b> <b>BTL-3</b>
<b>TEXTBOOKS</b>	
1	Haik, Y., Shahin, M. T. (2013). <i>Engineering Design Process</i> , Cengage Learning Publications, 1 <sup>st</sup> Edition.
2	Blanch, K.W., Clark, D.S. (2018). <i>Biochemical Engineering - Bioprocess Technology, Kinetics and Reactors</i> , Springer Verlag, 4 <sup>th</sup> Edition.
3	Michael, Z. H., Ralph, K. R., & Stig, I. O. (2018). <i>Life Cycle Assessment: Theory and Practice</i> . Springer. 1 <sup>st</sup> Edition.
<b>REFERENCE BOOKS</b>	
1	Arceivala, S.J., Asolekar, S.R. (2017). <i>Wastewater Treatment for Pollution Control and Reuse</i> , Tata McGraw Hill Publishers, 3rd Edition.
2	Binoy, R. M. (2018). <i>Principles of Bioreactor Design</i> . MV Learning. 1st Edition.
<b>E BOOKS</b>	
1	<a href="https://ocw.mit.edu/courses/chemical-engineering/10-442-biochemical-engineeringspring-2005/index.htm">https://ocw.mit.edu/courses/chemical-engineering/10-442-biochemical-engineeringspring-2005/index.htm</a>
<b>MOOC</b>	
1	Innovation by design by Prof. B.K. Chakravarthy - IIT Bombay <a href="https://onlinecourses.nptel.ac.in/noc22_de14/preview">https://onlinecourses.nptel.ac.in/noc22_de14/preview</a>

COURSE TITLE		BASIC TAMIL			CREDITS	2
COURSE CODE	ELS51003	COURSE CATEGORY	HS	L - T - P - S	2 - 0 - 0 - 1	
Version	1.0	Approval Details	35 <sup>th</sup> ACM 6 <sup>th</sup> Aug. 2022		LEARNING LEVEL	BTL- 3

ASSESSMENT SCHEME															
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments / Project	Surprise Test / Quiz etc., as approved by the Department Examination Committee "DEC"					Attendance	End Semester Examination ESE						
15%	15%	10%	5%					5%	50%						
<b>Course Description</b>	This Tamil course improves Tamil language skills of the students' Tamil letters and Grammar are included. This course provides an opportunity not only to get interest in learning Tamil Language but also they can learn to converse easily.														
<b>Course Objective</b>	<ol style="list-style-type: none"> <li>1. By studying this course, students will be able to write and speak Tamil easily in any situation, daily life and daily conversations.</li> <li>2. Develops language and interest in learning in students.</li> <li>3. Facilitates students to create opportunities for themselves in the society.</li> <li>4. Students also learn Tamil literature by developing interest in language department.</li> <li>5. This lesson plan helps the students to learn about the culture by learning the Tamil language.</li> </ol>														
<b>Course Outcome</b>	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> <li>1. Demonstrate the Letters and basic words of Tamil Language which are in daily use</li> <li>2. Develops the listening skills of Tamil language</li> <li>3. Utilize the letters and common words of the language for communication</li> <li>4. Develop the conversational skills</li> <li>5. Demonstrate the skill of reading and writing</li> </ol>														
<b>Prerequisites:</b> Plus Two -Intermediate Level															
<b>CO, PO AND PSO MAPPING</b>															
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	3	-	-	To be marked by respective department		
CO2	-	-	-	-	-	-	-	2	2	3	-	-			
CO3	-	-	-	-	-	-	-	-	-	3	-	-			
CO4	-	-	-	-	-	-	2	-	-	3	2	-			
CO5	-	-	-	-	-	-	-	-	2	3	2	3			
<b>1: Weakly related, 2: Moderately related and 3: Strongly related</b>															
அலகு - 1 தமிழ் எழுத்துக்கள்														(6 L)	



<p>தமிழ் எழுத்துகள் - ஓசைகள் - எண்கள் - வண்ணங்கள் - வடிவங்கள் - ஓர் எழுத்துச் சொற்கள் - பழங்கள் மற்றும் காய்கறிகள் - மலர்கள் - இயற்கை - மாதங்கள் சொற்கள் - பெயர்சொற்கள் - உரிச்சொற்கள் - வினைச்சொற்கள் - காலங்கள் - வாழ்த்துகள்.</p> <p>வகுப்பறை செயல்முறைகள் : 1. வார்த்தைகளை வட்டமிடுதல்.</p> <p>2. விடுபட்ட எழுத்துகளை நிரப்புக. 3. வடிவங்களுக்கு வண்ணம் தீட்டுக.</p>	<p>CO-1 BTL-2</p>
<p>அலகு - 2 கேட்டல் மற்றும் உச்சரித்தல் (6L)</p>	
<p>உயிரெழுத்துகள், மெய்யெழுத்துகள் மற்றும் உயிர்மெய் எழுத்துகளை உச்சரித்தல் - சிறுகதைகள் வாசித்தல் - எதிர்ச்சொற்கள் - பொருள்தருக - வாக்கியத்தில் அமைத்து எழுதுதல் - ஒரு சொல்லில் விடையளித்தல்.</p> <p>வகுப்பறை செயல்முறைகள் : 1. சொற்களைக் கேட்டு உச்சரிக்க செய்தல்.</p> <p>2. குழுவிவாதம் செய்தல். 3. கோடிட்ட இடங்களைச் சரியான சொற்களைக் கூறுதல்.</p>	<p>CO-2 BTL-2</p>
<p>அலகு -3 எழுத்துப் பயிற்சி (6L)</p>	
<p>தமிழ் எழுத்துகளை எழுத கற்பித்தல் - உயிர் எழுத்துகள் - மெய் எழுத்துகள் - உயிர்மெய் எழுத்துகள் - ஆயுத எழுத்து - சார்பெழுத்துகள் - ஒற்றெழுத்துகள் - ஒரு சொல் - இருசொல் எழுதுதல் - ஒருவரி, இருவரி எழுதுதல்.</p> <p>வகுப்பறை செயல்முறைகள்: 1. கோடிட்ட இடங்களை நிரப்புக.</p> <p>2. சரியான எழுத்துகளை வட்டமிடுதல். 3. ஒருவரி சொற்களை எழுதுதல்.</p>	<p>CO-3 BTL-3</p>
<p>அலகு - 4 உரையாடல்கள் கற்பித்தல் (6 L)</p>	
<p>சிறு உரையாடல்கள் கற்பித்தல் - வாழ்த்துக்கள் - வங்கியில் பணம் செலுத்துதல் - சந்தையில் கடைகாரரிடம் உரையாடுதல், பொது இடங்களில் உரையாடுதல்.</p> <p>வகுப்பறை செயல்முறைகள்: 1. குறு நாடகங்கள் நடித்து உரையாடல்கள் கற்பித்தல்.</p> <p>2. விண்ணப்ப படிவங்கள் பூர்த்தி செய்தல். 3. மின்னல் அட்டைகள் காண்பித்தல்.</p>	<p>CO-4 BTL-2</p>
<p>அலகு - 5 தமிழ் வாசிக்க மற்றும் எழுத கற்பித்தல் (6 L)</p>	
<p>கடிதங்கள் வாசித்தல் மற்றும் எழுதுதல் - விண்ணப்ப கடிதம், வங்கிகணக்கு படிவங்கள், இரயில் முன்பதிவு விண்ணப்ப படிவம் பூர்த்திசெய்தல் - கவிதை வாசித்தல் - செய்திதாள் வாசித்தல்.</p> <p>வகுப்பறை செயல் முறைகள்: 1. விண்ணப்ப படிவங்கள் பூர்த்திசெய்தல்.</p> <p>2. கவிதை வாசித்தல் போட்டிகள் 3. வகுப்பறை தேர்வுகள்</p>	<p>CO-5 BTL-3</p>
<p><b>TEXT BOOK</b></p>	
<p>1.</p>	<p>Saidhai. P.Sundaramurthy (2018). Learn Tamil Through English. Manimekalai Prasuram. Chennai - 17.Pages 1 to 84</p>
<p>2.</p>	<p>Pulavar Kulanthai (2020). Students Basic Tamil. Manimekalai Prasuram. Chennai -17. Pages1 to 84</p>
<p><b>REFERENCE BOOKS</b></p>	
<p>1.</p>	<p>Lenatamilvanan. (2017). Easy Tamil Grammar. Manimekalai Prasuram, Chennai -17, Pages 11 to 21</p>
<p>2.</p>	<p>Tamilnadu Board - NCERT/CBSE-Books Class – 6<sup>th</sup> TO 9<sup>th</sup> (2021-2022)</p>
<p><b>E-REFERENCES</b></p>	
<p>1</p>	<p><a href="https://cbsetamil.com/cbse-tamil-book/">https://cbsetamil.com/cbse-tamil-book/</a>,<a href="https://tamil.examsdaily.in/tnpsc-tamil-ilakkanam-">https://tamil.examsdaily.in/tnpsc-tamil-ilakkanam-</a></p>

COURSE TITLE		HINDI						CREDITS		2					
COURSE CODE		ELS51004		COURSE CATEGORY		HS		L - T - P - S		2 - 0 - 0 - 1					
VERSION	1.0	APPROVAL DETAILS		35 <sup>th</sup> ACM 6 <sup>th</sup> Aug. 2022				BTL LEVEL		3					
<b>ASSESSMENT SCHEME</b>															
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project		Surprise Test / Quiz etc., as approved by the Department Examination Committee "DEC" etc.,				Attendance	End Semester Examination ESE						
15%	15%	10%		5%				5%	50%						
Course Description	This course has been designed to develop the regional language skills of the students. The course includes Hindi language, literature, vocabulary and grammar. This course teaches students how to communicate accurately, appropriately and fluently in regional language.														
Course Objective	<ol style="list-style-type: none"> <li>1. To provide an environment to Speak and write in Hindi at the formal and informal levels and use it for daily conversation, presentation, group discussion and debate.</li> <li>2. To equip the students to Read, comprehend and answer questions based on literary texts.</li> <li>3. To help student to become sensitive to the requirements of the society and respond to it in a constructive way.</li> <li>4. To provide an environment to students to read and appreciate the literature.</li> </ol>														
Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> <li>1. Demonstrate the ability to write the grammatically correct sentences with accuracy.</li> <li>2. Integrating various components of Hindi Language and determining it through reading and listening.</li> <li>3. Organize and articulate ideas, concepts, and perceptions in a comprehensive manner in written correspondence, and speaking in formal and informal situations.</li> <li>4. Infer details from after listening and reading and implement it in various professional situations.</li> <li>5. Develop writing and speaking skills.</li> </ol>														
<b>Prerequisites:</b> Plus Two -Intermediate Level															
CO, PO AND PSO MAPPING															
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO-9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	3	-	-	To be marked by respective		
CO2	-	-	-	-	-	-	-	2	2	3	-	-			

CO3	-	-	-	-	-	-	-	-	-	3	-	-	department
CO4	-	-	-	-	-	-	2	-	-	3	2	-	
CO5	-	-	-	-	-	-	-	-	2	2	-	2	

**1: Weakly related, 2: Moderately related and 3: Strongly related**

**मॉड्यूल 1: हिंदी पत्र और लपि**

(6 L)

हिंदी स्वर और व्यंजन अक्षर - आश्रित स्वर सीखें - व्यंजन और व्यंजन समूह - अनुस्वर व्यंजन - संज्ञा - सर्वनाम - क्रिया (भविष्य) - संभावित विशेषण - काल - हिंदी के त्वरित नियम - अभिवादन - 2 अक्षर शब्द बनाना, 3 अक्षर शब्द - हर दिन शब्दावली - संख्याएं - रंग - परिवार - वस्त्र - बगीचा - घर - फल और सब्जियां - प्रकृति

**CO-1  
BTL-2**

**सुझाई गई गतिविधियां:**

देशी वक्ताओं द्वारा स्वर और व्यंजन का उच्चारण सुनना

स्वर और व्यंजन के वीडियो, 2 अक्षर और 3 अक्षर के शब्द, और प्रतिदिन प्रयोगार्थ शब्दावली

**मॉड्यूल 2: सुनने का कौशल**

(6 L)

स्वर और व्यंजन का उच्चारण सुनना - लघु कथाएँ सुनना - साक्षात्कार - भाषण - सामाजिक मुद्दों पर पाँड वार्ता - निर्धारित पाठों को सुनना: इकाई 1 सभ्यता का रहस्य, इकाई 2 - युवावों से - वार्तालापों को सुनना - जानकारी सुनना - सम्मेलनों के भाषण

**CO-2  
BTL-3**

**सुझाई गई गतिविधियां:**

सुनें और चुनें

उम्मीदवार पाठ को सुनते हैं और तीन विकल्पों के साथ बहुविकल्पीय प्रश्न का उत्तर देते हैं।

उम्मीदवार टीवी चैनलों में बातचीत - साक्षात्कार- अतिथि व्याख्यान, सम्मेलनों और कार्यशालाओं के दौरान विशेषज्ञों के भाषण सुनते हैं

**मॉड्यूल 3: बोलने का कौशल**

(6 L)

औपचारिक संवाद - अनौपचारिक संवाद - लिंग रूपों के साथ बोलना - संख्या - काल - परिवार, शहर, त्योहारों, शौक आदि जैसे सामान्य विषयों पर बोलना - पसंद और नापसंद व्यक्त करना - ज़रूरतें और संपत्ति - भूमिका निभाना।

**CO-3  
BTL-3**

**सुझाई गई गतिविधियां:**

प्रस्तुति - कार्यक्रमों का संचालन - भाषण देना

**मॉड्यूल- 4 : पढ़ने का कौशल**

(6 L)

नमूना पढ़ना - नकल पढ़ना - अक्षरों और शब्दों का सही उच्चारण करना - पढ़ने में प्रवाह - कहानियाँ पढ़ना- संपादकीय, समाचारपत्र के लेख पढ़ना।

**CO-4  
BTL-3**

**सुझाई गई गतिविधियां**

फ्लैशकार्ड का उपयोग - चार्ट - चित्रों की पहचान करना - शब्दों को पढ़ना

**मॉड्यूल-5 लेखन कौशल**

(6 L)

सामान्य पत्राचार - पत्र लेखन: छुट्टी लेने पत्र, बैंक खाता खोलना, पुस्तकें मंगवाने के लिए पत्र, शिकायत पत्र - संकेत विकास - ज्ञापन - नोटिस

**CO-5  
BTL-3**

**सुझाई गई गतिविधियां:**

निर्धारित पाठ्यपुस्तक के अनुसार अभ्यास पूरा करना

**पाठ्य पुस्तक**

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