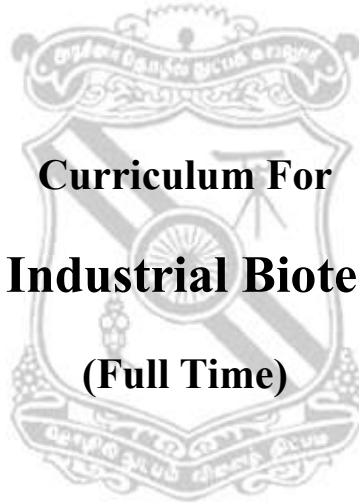




GOVERNMENT COLLEGE OF TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University)

Coimbatore - 641 013



Curriculum For

B. Tech. Industrial Biotechnology

(Full Time)

2022

Regulations

**OFFICE OF THE CONTROLLER OF EXAMINATIONS
GOVERNMENT COLLEGE OF TECHNOLOGY**

THADAGAM ROAD, COIMBATORE - 641 013

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GOVERNMENT COLLEGE OF TECHNOLOGY
(An Autonomous Institution Affiliated to Anna University, Chennai)
COIMBATORE-641 013

DEPARTMENT OF INDUSTRIAL BIOTECHNOLOGY

VISION AND MISSION

VISION

To achieve the highest caliber in Biotechnology research and innovation to develop intellectual leaders to meet out the societal, environmental, and industrial needs.

MISSION

To provide quality education with global competence and molding the students as technologically sound and ethically motivated technocrats through advanced skill based learning.



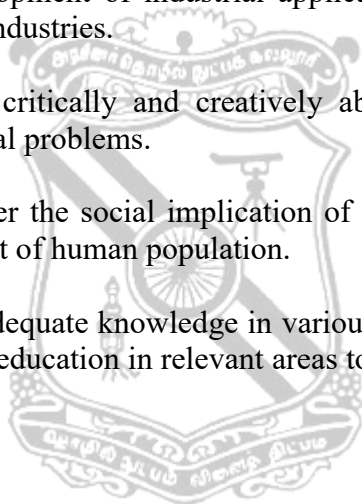
GOVERNMENT COLLEGE OF TECHNOLOGY
(An Autonomous Institution Affiliated to Anna University, Chennai)
COIMBATORE-641 013

DEPARTMENT OF INDUSTRIAL BIOTECHNOLOGY

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The following Programme educational objectives are designed based on the department mission.

- PEO 1:** Graduates will possess necessary skills and knowledge in the frontier areas of biotechnology.
- PEO 2:** Graduates will be able to implement the engineering principles to biological systems for the development of industrial applications as well as entrepreneurship skills to start biotech industries.
- PEO 3:** Graduates will think critically and creatively about the use of biotechnology to address local and global problems.
- PEO 4:** Graduates will consider the social implication of their work as it affects the health, safety and environment of human population.
- PEO 5:** Graduates will have adequate knowledge in various fields of biotechnology, enabling them to pursue higher education in relevant areas to enhance their professionalism.



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DEPARTMENT OF INDUSTRIAL BIOTECHNOLOGY

PROGRAMME OUTCOMES (POs)

Students in the Industrial Biotechnology Programme should possess the following POs at the time of their graduation.

- PO1 Engineering knowledge:** Apply the concepts of mathematics, science, engineering fundamentals to identify the solution of complex engineering problems.
- PO2 Problem analysis:** Identify, formulate, review research literature and analyze complex engineering problems providing substantiated conclusions using basic principles of mathematics, Natural sciences and engineering sciences.
- PO3 Design/development of solutions:** Design and develop processes to meet the emerging technological demands with suitable consideration of public health, the cultural, societal, and environmental safety.
- PO4 Conduct investigations of complex problems:** Conduct effective research including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
- PO5 Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- PO6 The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO7 Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.
- PO8 Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9 Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
- PO10 Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO11 Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles to apply the strategies on one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO12 Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological innovation.

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DEPARTMENT OF INDUSTRIAL BIOTECHNOLOGY

PROGRAMME SPECIFIC OUTCOMES (PSOs)

- PSO 1 :** Demonstrate competence in Biological sciences and technology courses to pursue higher education.
- PSO 2 :** Demonstrate an ability to acquire technical skills and work ethics to meet the industry needs and to become an entrepreneur.



GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE – 641 013

B.Tech. INDUSTRIAL BIOTECHNOLOGY (FULL TIME)

FIRST SEMESTER


Sl. No.	Course Code	Course Title	Category	CA Marks	End Sem Marks	Total Marks	Hours/Week			
							L	T	P	C
THEORY										
	22BMC1Z0	Induction Programme	MC	-	-	-	-	-	-	0
1	22BHS1Z1	தமிழர் மரபு Heritage of Tamils	HSMC	40	60	100	1	0	0	1
2	22BHS1Z2	Values and Ethics	HSMC	40	60	100	3	0	0	3
3	22BBS1Z1	Linear Algebra and Calculus	BS	40	60	100	3	1	0	4
4	22BBS1Z2	Engineering Physics	BS	40	60	100	3	0	0	3
5	22BBS103	Chemistry for Biotechnology	BS	40	60	100	3	0	0	3
6	22BES101	Basics of Electrical and Electronics Engineering	ES	40	60	100	3	0	0	3
PRACTICAL										
7	22BHS1Z3	Cambridge English	HSMC	60	40	100	0	0	2	1
8	22BBS1Z4	Chemistry Laboratory	BS	60	40	100	0	0	3	1.5
9	22BES1Z2	Engineering Graphics	ES	60	40	100	1	0	4	3
		TOTAL		420	480	900	17	1	9	22.5

SECOND SEMESTER

Sl. No.	Course Code	Course Title	Category	CA Marks	End Sem Marks	Total Marks	Hours/Week			
							L	T	P	C
THEORY										
1	22BHS2Z4	தமிழரும் தொழில் நுட்பமும் Tamils and Technology	HSMC	40	60	100	1	0	0	1
2	22BHS2Z5	Professional English	HSMC	40	60	100	2	1	0	3
3	22BBS205	Differential Equations and Numerical Methods	BS	40	60	100	3	1	0	4
4	22BES203	Programming in C	ES	40	60	100	3	0	0	3
5	22BPC201	Biochemistry-I	PC	40	60	100	3	0	0	3
6	22BMC2Z1	Environmental Science and Engineering	MC	40	60	100	3	0	0	0
		NCC Credit Course (Optional)					2	0	0	0
PRACTICAL										
7	22BBS2Z6	Physics Laboratory	BS	60	40	100	0	0	3	1.5
8	22BES2Z4	Workshop Practice	ES	60	40	100	0	0	3	1.5
9	22BES205	Programming in C Laboratory	ES	60	40	100	0	0	3	1.5
		TOTAL		420	480	900	15	2	9	18.5

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Coimbatore-641013.

INDUSTRIAL BIOTECHNOLOGY

22BMC1Z0	INDUCTION PROGRAMME	SEMESTER I
<p>Details of the Programme:</p> <p>Day 0: College Admission</p> <p>Day 1: Orientation Programme</p> <p>Day2 Onwards : Induction Programme</p> <p>Activities: Physical activity, Playground Events, Yoga Practices, Literary, Proficiency modules, Team Building, Lectures by Eminent people, Familiarization to department, Branch oriented information, Motivational speakers, Talent exposure, Quiz completion, Visit to local areas....etc.</p> 		

22BHS1Z1	தமிழர் மரபு Heritage of Tamils (Common to all Branches)	SEMESTER I
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	HSMC	1	0	0	1

Course Objectives	1.	
UNIT – I	LANGUAGE AND LITERATURE	3 Periods
Language Families in India - Dravidian Languages – Tamil as a Classical Language – Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature- Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.		
UNIT – II	HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE	3 Periods
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.		
UNIT – III	FOLK AND MARTIAL ARTS	3 Periods
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.		
UNIT – IV	THINAI CONCEPT OF TAMILS	3 Periods
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature- Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.		
UNIT – V	CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE	3 Periods
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.		
Contact Periods: Lecture: 15 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 15 Periods		

TEXT BOOK:

1	தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2	கணினித்தமிழ் – முனைவர் இல.சுந்தரம். (விகடன் பிரசுரம்).
3	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4	பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

REFERENCES:

1	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:International Institute of Tamil Studies.
3	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)(Published by: International Institute of Tamil Studies).
4	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by:International Institute of Tamil Studies.)
5	Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by:Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)
6	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay)(Published by: The Author)
7	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
8	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) –Reference Book.

COURSE OUTCOMES:		Bloom’s Taxonomy Mapped
Upon completion of the course, the students will be able to:		
CO1		
CO2		
CO3		
CO4		
CO5		

COURSE ARTICULATION MATRIX															
COs/POs	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															
CO2															
CO3															
CO4															
CO5															
22BHS1Z1															
1 – Slight, 2 – Moderate, 3 – Substantial															

22BHS1Z1	தமிழர் மரபு Heritage of Tamils (Common to all Branches)	SEMESTER I
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	HSMC	1	0	0	1

Course Objectives	1.	
அலகு I	மொழி மற்றும் இலக்கியம்	3 Periods

இந்திய மொழிக் குடும்பங்கள்- திராவிட மொழிகள்- தமிழ் ஒரு செம்மொழி- தமிழ் செவ்விலக்கியங்கள் -சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை-சங்க இலக்கியத்தில் பகிர்தல் அறம்-திருக்குறளில் மேலாண்மைக் கருத்துக்கள்- தமிழ்க்காப்பியங்கள், தமிழகத்தில் சமண பௌத்தசமயங்களின் தாக்கம்-பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள்-சிறிலக்கியங்கள்-தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி-தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II	மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை-சிற்பக் கலை	3 Periods
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நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள்-பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளூர் சிலை - இசைக் கருவிகள் - மிருதங்கம் , பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III	நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்	3 Periods
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தெருக்கூத்து, கரகாட்டம்-வில்லுப்பாட்டு-கணியான் கூத்து-ஓயிலாட்டம்-தோல்பாவைக் கூத்து-சிலம்பாட்டம் -வளரி-புலியாட்டம் -தமிழர்களின் விளையாட்டுகள்.

அலகு IV	தமிழர்களின் திணைக் கோட்பாடுகள்	3 Periods
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தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு -சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் -சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு	3 Periods
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இந்திய விடுதலைபோரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிக்கள் - தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு.

Contact Periods:

Lecture: 15 Periods Tutorial: 0 Periods Practical: 0Periods Total: 15 Periods

TEXT BOOK:

1	தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2	கணினித்தமிழ் - முனைவர் இல.சுந்தரம் . (விகடன் பிரசுரம்).
3	கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
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REFERENCES:

1	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
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4	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by:International Institute of Tamil Studies.)
5	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by:Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)
6	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay)(Published by: The Author)
7	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
8	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) –Reference Book.

COURSE OUTCOMES:		Bloom's Taxonomy Mapped
Upon completion of the course, the students will be able to:		
CO1		
CO2		
CO3		
CO4		
CO5		

COURSE ARTICULATION MATRIX																
COs/POs	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																
CO2																
CO3																
CO4																
CO5																
22BHS1Z1																
1 – Slight, 2 – Moderate, 3 – Substantial																

22BHS1Z2	VALUES AND ETHICS <i>(Common to all Branches)</i>	SEMESTER I
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	HSMC	3	0	0	3

Course Objectives	<ol style="list-style-type: none"> 1. To understand and appreciate the ethical issues faced by an individual in profession, society and polity 2. To learn about Engineering Ethics and case studies 3. To understand the negative health impacts of certain unhealthy behaviors 4. To appreciate the need and importance of physical, emotional health and social health 5. To get familiar with the global issues
UNIT – I	BEING GOOD AND RESPONSIBLE 9 Periods
Morals, Values and Ethics - Integrity - Work Ethics - Service Learning - Civic Virtue - Respect for Others - Living Peacefully - Caring - Sharing - Honesty - Courage - Valuing Time - Cooperation - Commitment - Empathy - Self-Confidence – Character.	
UNIT – II	ENGINEERING AS SOCIAL EXPERIMENTATION 9 Periods
Engineering Ethics: Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Models of Professional Roles. Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – Case studies: Chernobyl disaster and Titanic disaster.	
UNIT – III	ADDICTION AND HEALTH 9 Periods
Peer pressure-Alcoholism : Ethical values, causes, impact, laws, prevention–ill effects of smoking - Prevention of Suicides; Sexual Health:Prevention and impact of pre-marital pregnancy and Sexually Transmitted Diseases. Drug Abuse: Abuse of different types of legal and illegal drugs: Ethical values, causes, impact, laws and prevention.	
UNIT – IV	PROFESSIONAL ETHICS 9 Periods
Abuse of Technologies: Hacking and other cyber crimes, Addiction to mobile phone usage, Video games and Social networking websites.	
UNIT – V	GLOBAL ISSUES 9 Periods
Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers - consulting engineers - engineers as expert witnesses and advisors - Code of Conduct – Corporate Social Responsibility.	
Contact Periods:	
Lecture: 45 Periods	Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

TEXT BOOK:

1	<i>Mike W Martin and Roland Schinzinger, “Ethics in Engineering”, 4th Edition, McGraw-Hill, New York 2017.</i>
2	<i>Govindarajan M, Natarajan S and Senthil Kumar VS, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2013.</i>

REFERENCES:

1	<i>Dhaliwal, K.K, "Gandhian Philosophy of Ethics: A Study of Relationship between his Presupposition and Precepts", Writers Choice, New Delhi, India, 2016.</i>
2	<i>Jayshreesuresh, B.S.Raghavan, "Human values and professional ethics",S.Chand & company Ltd, New Delhi, 2th Edition, 2007.</i>
3	<i>L.A. and Pagliaro, A.M, "Handbook of Child and Adolescent Drug and Substance Abuse: Pharmacological, Developmental and Clinical Considerations", Wiley Publishers, U.S.A, 2012.</i>
4	<i>Pandey, P. K (2012), "Sexual Harassment and Law in India", Lambert Publishers, Germany,2012.</i>
5	<i>Kiran D.R, "Professional ethics and Human values", Tata McGraw Hill, New Delhi, 2007.</i>
6	<i>Edmund G See Bauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers",Oxford University Press, Oxford, 2001.</i>
7	<i>David Ermann and Michele S Shauf, "Computers, Ethics and Society",Oxford University Press, 2003.</i>
8	<i>Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics",Prentice Hall of India, New Delhi, 2004.</i>

COURSE OUTCOMES:		Bloom's Taxonomy Mapped
Upon completion of the course, the students will be able to:		
CO1	Follow sound morals and ethical values scrupulously to prove as good citizens.	K3
CO2	Assess the relevance of ethics and morals in engineering and to learn case studies.	K3
CO3	Describe the concept of addiction and how it will affect the physical and mental health.	K2
CO4	Identify ethical concerns while using advanced technologies.	K2
CO5	Judge the code of conduct, Environmental ethics and computer ethics.	K3

COURSE ARTICULATION MATRIX														
COs/POs	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
CO1	-	-	-	-	-	3	3	3	3	2	1	-	-	1
CO2	-	-	-	-	-	3	-	3	3	-	1	-	-	1
CO3	-	-	-	-	-	3	-	3	3	2	1	-	-	1
CO4	-	-	-	-	-	3	3	3	3	1	1	1	-	1
CO5	-	-	-	-	-	3	3	3	3	-	1	3	-	1
22BHS1Z2	-	-	-	-	-	3	2	3	3	1	1	1	-	1
1 – Slight, 2 – Moderate, 3 – Substantial														

22BBS1Z1	LINEAR ALGEBRA AND CALCULUS <i>(Common to all Branches)</i>	SEMESTER I
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	BS	3	1	0	4

Course Objectives	<ol style="list-style-type: none"> 1. To acquire knowledge of system of equations, eigenvalues, eigenvectors, diagonalization of matrices and reduction of quadratic forms to canonical forms. 2. To obtain the knowledge of analyze the functions using Limits and derivative recognize the appropriate tools of differential calculus to solve applied problems. 3. To obtain the knowledge of definite and improper integration and recognize the appropriate tools of Integral Calculus to solve applied problems 4. To develop the skills in solving the functions of several variables by partial derivatives. 5. To acquire knowledge of multiple integration and related applied problems in various geometry
UNIT – I	LINEAR ALGEBRA 9+3 Periods
Consistency of System of Linear Equations - Eigen values and eigenvectors - Diagonalization of matrices by orthogonal transformation - Cayley-Hamilton Theorem - Quadratic to canonical forms.	
UNIT – II	DIFFERENTIAL CALCULUS 9+3 Periods
Limit and continuity of function - Rolle's theorem - Mean value theorems - Taylor's and Maclaurin's theorems. Application of Differential Calculus: Radius of curvature, Centre of curvature, Circle of curvature and Evolutes of a curve.	
UNIT – III	INTEGRAL CALCULUS 9+3 Periods
Evaluation of definite integral by trigonometric substitution - Convergence and Divergence of improper integrals - Beta & Gamma functions and their properties - Applications of definite integrals to evaluate surface areas and volume of revolution (Cartesian coordinates only).	
UNIT – IV	PARTIAL DERIVATIVES AND ITS APPLICATIONS 9+3 Periods
Partial derivatives - total derivative - Taylor's series – Jacobians - Maxima, minima and saddle points - Method of Lagrange multipliers.	
UNIT – V	MULTI VARIABLE INTEGRAL CALCULUS 9+3 Periods
Double integral - Area as double integral - change of order of integration in double integrals - Triple Integrals - Volume as Triple Integral. Change of variables: Cartesian to polar, Spherical polar coordinates, Cylindrical polar coordinates.	
Contact Periods :	
Lecture: 45 Periods Tutorial: 15 Periods Practical: 0 Periods Total: 60 Periods	

TEXT BOOK

1	<i>Veerarajan T., "Engineering Mathematics I", Tata McGraw-Hill Education(India)Pvt. Ltd, New Delhi, 2015.</i>
2	<i>David C.Lay, "Linear Algebra and Its Application", Pearson Publishers, 6th Edition, 2021.</i>

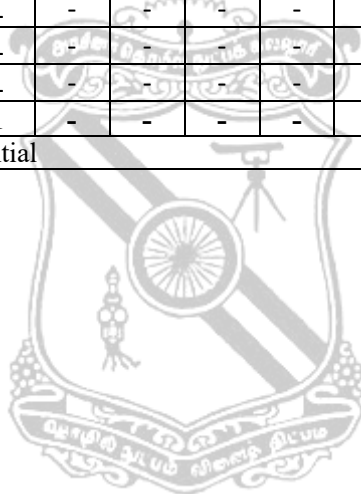
REFERENCES

1	<i>B.S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2017.</i>
2	<i>Howard Anton, "Elementry Linear Algebra", 11th Edition, Wiley Publication, 2013.</i>
3	<i>Narayanan.S and Manicavachagom Pillai. T.K. – "Calculus Vol I and Vol II", S.chand & Co, Sixth Edition, 2014.</i>
4	<i>H.K. Dass, "Advance Engineering Mathematics", S. Chand and company, Eleventh Edition, 2015.</i>
5	<i>Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publicaitons, Eighth Edition, 2012.</i>

COURSE OUTCOMES:		Bloom's Taxonomy Mapped
Upon completion of the course, the students will be able to:		
CO1	Solve the linear system of equations, diagonalize matrix by orthogonal transformation and reduce quadratic form to canonical form.	K5
CO2	Compare and contrast the ideas of continuity and differentiability and use them to solve engineering problems.	K5
CO3	Acquire fluency in integration of one variable and apply them to find surface area and volumes.	K5
CO4	Apply the techniques of partial derivatives in functions of several variables.	K5
CO5	Use multiple integration for finding area, surface and volume of different geometry.	K5

COURSE ARTICULATION MATRIX														
COs/POs	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
CO1	3	3	1	1	-	-	-	-	-	-	-	1	-	1
CO2	3	3	1	1	-	-	-	-	-	-	-	1	-	1
CO3	3	3	1	1	-	-	-	-	-	-	-	1	-	1
CO4	3	3	1	1	-	-	-	-	-	-	-	1	-	1
CO5	3	3	1	1	-	-	-	-	-	-	-	1	-	1
22BBS1Z1	3	3	1	1	-	-	-	-	-	-	-	1	-	1

1 – Slight, 2 – Moderate, 3 – Substantial



22BBS1Z2	ENGINEERING PHYSICS <i>(Common to all Branches)</i>	SEMESTER I
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	BS	3	0	0	3

Course Objectives	1. To understand the basics about crystal systems and defects 2. To understand the principle, characteristics, working and applications of laser and optical fiber 3. To solve problems in bending of beams 4. To solve quantum mechanical problems with the understanding of Quantum Principles 5. To understand the properties, production and applications of ultrasonic waves.
UNIT – I	CRYSTAL PHYSICS 9 Periods
Introduction – Crystalline and amorphous materials – Lattice – Unit Cell –Crystal system - Bravais lattices – Miller indices – Reciprocal lattice - d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Crystal defects – Point, line and surface defects.	
UNIT – II	LASER PHYSICS AND FIBER OPTICS 9 Periods
Introduction- Principle of laser action - characteristics of laser - Spontaneous emission and Stimulated emission –Einstein’s coefficients - population inversion – methods of achieving population inversion –Optical Resonator -Types of Lasers – Principle, construction and working of CO ₂ Laser - applications of laser. Introduction – Basic Principles involved in fiber optics- Total internal reflection–Propagation of light through optical fiber –Derivation for Numerical Aperture and acceptance angle - fractional index change.	
UNIT – III	PROPERTIES OF MATTER 9 Periods
Elasticity- Hooke’s law- stress-strain diagram - Factors affecting elasticity – Moment (Q) - Couple (Q) – Torque (Q) – Beam - Bending moment - Depression of a cantilever – Twisting Couple- Young’s modulus by uniform bending - I shaped girders.	
UNIT – IV	QUANTUM PHYSICS AND APPLICATIONS 9 Periods
Limitations of classical Physics - Introduction to Quantum theory - Dual nature of matter and radiation- de-Broglie wavelength in terms of voltage, energy and temperature –Heisenberg’s Uncertainty principle – verification – physical significance of a wave function- Schrödinger’s Time independent and Time dependent wave equations -- Particle in a one dimensional potential well - Scanning Electron Microscope (SEM)-Transmission Electron Microscope (TEM).	
UNIT – V	ULTRASONICS 9 Periods
Introduction - properties of ultrasonic waves - production of ultrasonic waves - Magnetostriction effect- Magnetostriction generator- Piezoelectric effect- Piezoelectric generator- Acoustic grating - Determination of wavelength and velocity of ultrasonic waves- cavitation - applications- ultrasonic drilling- ultrasonic welding- ultrasonic soldering and ultrasonic cleaning- Non- destructive Testing- Pulse echo system.	
Contact Periods: Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods	

TEXT BOOK:

1	<i>K. Rajagopal, “Engineering Physics”, PHI Learning Private Limited, 2015.</i>
2	<i>P. K. Palanisamy, “Engineering Physics-I”, Scitech publications Private Limited, 2015.</i>
3	<i>M. Arumugam, “Engineering Physics”, Anuradha Publishers, 2010.</i>

REFERENCES:

1	Arthur Beiser, " Concepts of Modern Physics ", Tata McGraw-Hill, 2010.
2	D. Halliday, R. Resnick and J. Walker, " Fundamentals of Physics ", 6 th Edition, John Wiley and Sons, 2001.
3	William T. Silfvast, " Laser Fundamentals ", 2 nd Edition, Cambridge University Press, New York 2004.
4	M. N. Avadhanulu and P.G. Kshirsagar, " A Textbook of Engineering Physics ", S. Chand and Company Ltd, 2010.
5	R. K. Gaur and S. L. Gupta, " Engineering Physics ", Dhanpat Rai Publishers, 2009.

COURSE OUTCOMES:		Bloom's Taxonomy Mapped
Upon completion of the course, the students will be able to:		
CO1	Interpret the crystal structure and analyse the type of defect	K4
CO2	Explain the principle, characteristics, working and applications of laser and optical fiber Analyse and solve problems in laser and optical fiber	K4
CO3	Solve problems in bending of beams Apply the knowledge in construction of buildings	K3
CO4	Explain the importance of quantum mechanics Solve problems in basic quantum physics Apply the wave equations in real time problems	K3
CO5	Explain the properties and production of ultrasonic waves Apply ultrasonic waves for industrial problems	K3

COURSE ARTICULATION MATRIX														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-	1	-
22BBS1Z2	2	1	-	-	-	-	-	-	-	-	-	-	1	-

1 – Slight, 2 – Moderate, 3 – Substantial

22BBS103	CHEMISTRY FOR BIOTECHNOLOGY	SEMESTER I
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	BS	3	0	0	3

Course Objectives	1. To acquaint the student with the principles of organic chemistry of nucleophilic and electrophilic reactions. 2. To introduce about the concepts of stereochemistry and its configuration, synthesis and important reactions of five- and six-member hetero cyclic compounds. 3 To inculcate sound understanding of preparations, properties of bio-molecules like carbohydrate, amino acids. 4. To acquire basic knowledge about the nuclear reactions, transmutations and few tracer techniques. 5. To impart the knowledge about the nanoparticles, its preparations, properties, types and applications in various field.				
UNIT – I	BASIC PRINCIPLES OF ORGANIC CHEMISTRY	9 Periods			
Bonding in organic molecules – inductive effect, electrometric effect and mesomeric effect – Intermediates of organic reactions: carbocation, free radicals and carbene – Nucleophilic substitution – SN ₁ and SN ₂ , Electrophilic substitution – Elimination reaction–E ₁ and E ₂ .					
UNIT – II	STEREOCHEMISTRY AND HETEROCYCLIC COMPOUNDS	9 Periods			
Stereoisomerism – classification – enantiomers and diastereoisomers – chirality, optical activity – Optical isomerism (D&L, R&S configuration) – Geometrical (E&Z configuration). Hetero cyclic compounds – pyrrole, pyridine, quinoline and indole – aromaticity, synthesis and reactions of the compounds.					
UNIT – III	INTRODUCTION TO BIO-MOLECULES	9 Periods			
Basic principles – Bio-molecules, structure and properties of important bio-molecules: Carbohydrates– classification, structure of mono saccharides (Glucose & Fructose), Disaccharides: Sucrose, Maltose - Polysaccharides: Starch, Cellulose, occurrence and functions – Preparation, properties and uses of amino acids and proteins.					
UNIT – IV	NUCLEAR CHEMISTRY	9 Periods			
Nuclear fission (Nuclear reactor) and fusion (solar energy) – Nuclear reactions: Q value, cross sections, types of reactions, nuclear transmutations, radioactive techniques – tracer technique, neutron activation analysis – Radiolysis of water – G Value and applications of radioactivity.					
UNIT – V	NANOMATERIALS	9 Periods			
Nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanorod and nanotube. Preparation of nanomaterials: chemical vapour deposition, electrochemical deposition. Applications of nanomaterials in medicine, agriculture and electronics.					
Contact Periods:					
Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total:45 Periods					

TEXT BOOKS:

1	Cox M. M. and Nelson D. L, Lehninger“ <i>Principles of Bio chemistry</i> ”, W H Freeman and Co., New York, 2021.
2	Jain. P.C. and Monica Jain, “ <i>Engineering Chemistry</i> ”, Dhanpat Rai Publications. Pvt. Ltd. New Delhi, 16 th Edition, 2017

REFERENCES:

1	Robert Neilson Boyd, Saibalkanti Robert, Thornton Morrison "Organic Chemistry" kindle Edition 2014.
2	Murray, R.K, Kennelly P.J, Rodwell V.W, et al. "Harper's Illustrated Biochemistry", 29 th Edition, McGraw-Hill, 2011
3	Charles P.Poole, Jr., Frank J.Owens""Introduction to NanoTechnology", Wiley-India Edition, 2006.
4	Said SalaheldeenElnashaie, FiroozehDanafar, Hassan Hashemipour Rafsanjani "Nanotechnology for Chemical Engineers" 1 st Edition 2015, Kindle Edition.

COURSE OUTCOMES:		Bloom's Taxonomy Mapped
Upon completion of the course, the students will be able to:		
CO1	Make the students conversant with the basic concepts in nucleophilic substitution, electrophilic substitution, and elimination reaction.	K2
CO2	Assign the different types of stereoisomerism, configurations preparations and properties of heterocyclic compounds.	K3
CO3	Apply the mechanism of organic reactions in synthesis of biomolecules.	K3
CO4	Recognize and apply the concepts of nuclear chemistry with different tracer techniques.	K3
CO5	Implement the basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for bio technological field.	K2

COURSE ARTICULATION MATRIX														
COs/POs	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
CO1	2	1	1	1	-	-	2	-	-	-	-	1	-	-
CO2	2	1	1	1	-	-	2	-	-	-	-	1	1	-
CO3	2	1	1	1	-	-	2	-	-	-	-	1	1	-
CO4	2	1	1	1	-	-	2	-	-	-	-	1	-	-
CO5	2	1	1	1	-	-	2	-	-	-	-	1	1	-
22BBS103	2	1	1	1	-	-	2	-	-	-	-	1	1	-
1 – Slight, 2 – Moderate, 3 – Substantial														

22BES101	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING <i>(Common to CIVIL, MECH, PRODN, CSE, IT & IBT Branches)</i>	SEMESTER I
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	ES	3	0	0	3

Course Objectives	<ol style="list-style-type: none"> 1. To study the basic concepts of electric circuits, electronic devices and communication engineering. 2. To know the fundamentals of DC and AC machines. 3. To familiar with the basics of analog and digital electronics. 4. To understand the basics of house wiring. 5. To introduce the components of electrical installations and energy conservation. 				
UNIT – I	ELECTRICAL CIRCUITS			9 Periods	
Electrical circuit elements (R,L and C) - Voltage and Current sources – Ohm’s Law – Kirchoff laws – Time domain analysis of First order RL and RC circuits – Representation of sinusoidal waveforms – Average, RMS and Peak values – Phasor representation – Real, Reactive, Apparent power and power factor.					
UNIT – II	ELECTRICAL MACHINES AND MEASUREMENTS			9 Periods	
Construction, Principle of Operation, basic equations and Types, Characteristics and Applications of DC generators, DC motors, Single phase Transformer, Single phase and Three phase Induction motor. Operating principles of Moving coil, Moving iron Instruments (Ammeter and Voltmeters).					
UNIT – III	ANALOG AND DIGITAL ELECTRONICS			9 Periods	
Analog Electronics: Semiconductor devices – P-N junction diode, Zener diode, BJT, Operational amplifier – principle of operation, Characteristics and applications. Digital Electronics: Introduction to numbers systems, basic Boolean laws, reduction of Boolean expressions and implementation with logic gates.					
UNIT – IV	FUNDAMENTAL OF COMMUNICATION AND TRANSDUCERS			9 Periods	
Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations – Resistive, Inductive, capacitive Transducers- Introduction.					
UNIT – V	ELECTRICAL INSTALLATIONS AND ENERGY CONSERVATION			9 Periods	
Single phase and three phase system – phase, neutral and earth, basic house wiring -tools and components, different types of wiring - basic safety measures at home and industry – Energy efficient lamps - Energy billing. Introduction to UPS and SMPS.					
Contact Periods:					
Lecture: 45 Periods		Tutorial: 0 Periods		Practical: 0 Periods	
Total: 45 Periods					

TEXT BOOKS:

1	R.Muthusubramaniam, R.Salivaganan, Muralidharan K.A., “ Basic Electrical and Electronics Engineering ” Tata McGraw Hill , Second Edition 2010
2	Mittle V.N and Aravind Mittal, “ Basic Electrical Engineering ”, Tata McGraw Hill, Second Edition, New Delhi, 2005

REFERENCES:

1	D.P.Kothari, I.J. Nagrath, “ Basic Electrical Engineering ”, Tata McGraw Hill, 2010
2	Nagsarkar T.K and Sukhija M.S, “ Basic Electrical Engineering ”, Oxford Press, 2005
3	E.Hughes, “ Electrical and Electronics Technology ”, Pearson, 2010
4	MohmoodNahvi and Joseph A.Edminister, “ Electric Circuits ”, Shaum Outline series, McGraw Hill, Sixth edition, 2014
5	Premkumar N and Gnanavadeivel J, “ Basic Electrical and Electronics Engineering ”, Anuradha Publishers, 4 th Edition, 2008
6	Allan S Morris, “ Measurement and Instrumentation Principles ” Elsevier, First Indian Edition, 2008.
7	S.L. Uppal , “ Electrical Wiring Estimating and Costing ”, Khanna publishers, New Delhi, 2006.

COURSE OUTCOMES:		Bloom’s Taxonomy Mapped
Upon completion of the course, the students will be able to:		
CO1	Analyze the DC and AC circuits	K4
CO2	Describe the operation and characteristics of electrical machines	K4
CO3	Classify and compare various semiconductor devices and digital electronics	K3
CO4	Infer the concept of communication engineering and Transducers.	K2
CO5	Assemble and implement electrical wiring and electrical installations	K6

COURSE ARTICULATION MATRIX														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	1	1	1	1	-	-	-	-	-	-	-	-	2	-
CO2	1	-	-	1	-	-	-	1	-	-	-	-	3	-
CO3	1	-	1	-	-	-	-	-	-	1	-	-	2	-
CO4	2	1	1	1	-	-	1	-	-	-	-	-	2	-
CO5	-	-	1	1	-	-	-	-	-	-	-	-	3	-
22BES101	1	1	1	1	-	-	1	1	-	1	-	-	2	-
1 – Slight, 2 – Moderate, 3 – Substantial														

22BBS1Z4	CHEMISTRY LABORATORY (Common to all Branches)	SEMESTER I
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	BS	0	0	3	1.5

COURSE OBJECTIVES:

To inculcate the practical applications of Chemistry to students and make them apply in the fields of engineering and technology.

LIST OF EXPERIMENTS

1.	Estimation of hardness by EDTA method.
2.	Conductometric titration of mixture of strong acid and weak acid using strong base.
3.	Estimation of chloride by Argentometric method.
4.	Potentiometric titration of ferrous iron by dichromate.
5.	Determination of Saponification value of an oil.
6.	Estimation of Iron by Spectrophotometry.
7.	Estimation of Dissolved Oxygen.
8.	Estimation of HCl by pH titration.
9.	Estimation of Copper in brass sample.
10.	Estimation of Manganese in Pyrolusite ore.
11.	Anodization of aluminium.
12.	Determination of corrosion rate and inhibitor efficiency of mild steel in acid media by weight loss method.

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 45 Periods Total: 45 Periods

REFERENCE BOOKS:

1	<i>A.O. Thomas, "Practical Chemistry", Scientific Book Centre, Cannanore, 2006.</i>
2	<i>Vogel's "Text book of Quantitative Analysis", Jeffery G H, Basset J, Menthom J, Denney R.C., 6th Edition, EBS, 2009.</i>

COURSE OUTCOMES: Upon the completion of the course, the student will be able to		Bloom's Taxonomy Mapped
CO1	Analyze the quality of water samples with respect to their hardness and DO.	K3
CO2	Determine the amount of metal ions through potentiometric and spectroscopic techniques.	K3
CO3	Infer the strength of acid, mixtures of acids by pH meter and conductivity cell.	K3
CO4	Estimate the chloride, manganese and copper from various samples.	K3
CO5	Interpret the corrosion rate determination and anodizing method.	K2

COURSE ARTICULATION MATRIX

COs/POs	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
CO1	2	1	1	-	-	2	3	-	2	1	-	1	1	-
CO2	2	1	-	-	-	-	3	-	2	1	-	1	1	-
CO3	2	1	-	1	-	-	3	-	2	1	-	1	1	-
CO4	2	1	-	-	-	-	3	-	2	1	-	1	1	-
CO5	2	1	1	1	-	-	3	-	2	1	-	1	-	-
22BBS1Z4	2	1	1	1	-	1	3	-	2	1	-	1	1	-

1 – Slight, 2 – Moderate, 3 – Substantial

22BES1Z2	ENGINEERING GRAPHICS <i>(Common to all Branches)</i>	SEMESTER I
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	ES	1	0	4	3

Course Objectives	1. To understand the geometrical constructions. 2. To study the various types of projections. 3. To identify different section of solids. 4. To perform the development of surfaces and view of solids. 5. To familiarize with CAD packages.				
UNIT – I	GEOMETRICAL CONSTRUCTIONS AND PLANE CURVES	3+12 Periods			
Principles of Engineering Graphics and their significance - Basic geometrical constructions. Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Drawing of tangents and normal to the above curves.					
UNIT – II	ORTHOGRAPHIC PROJECTIONS	3+12 Periods			
Introduction to Orthographic Projection - Conversion of pictorial views to orthographic views. Projection of points - Projection of straight lines with traces - Projection of planes (polygonal and circular surfaces) inclined to both the principal planes.					
UNIT – III	PROJECTION AND SECTION OF SOLIDS	3+12 Periods			
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids, when the axis is inclined to both the principal planes by rotating object method. Sectioning of prisms, pyramids, cylinder and cone in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section.					
UNIT – IV	DEVELOPMENT OF SURFACES AND ISOMETRIC PROJECTIONS	3+12 Periods			
Development of lateral surfaces of simple and sectioned solids – prisms, pyramids, cylinder and cone. Principles of isometric projection – isometric scale – isometric projections of simple solids and truncated solids - prisms, pyramids, cylinder, cone- combination of two solid objects in simple vertical positions.					
UNIT – V	COMPUTER AIDED DRAFTING	(3+12 Periods)			
Introduction to computer aided drafting package to make 2D Drawings. Object Construction: Page layout – Layers and line types – Creating, editing and selecting the geometric objects. Mechanics: Viewing, annotating, hatching and dimensioning the drawing – Creating blocks and attributes. Drafting: Create 2D drawing. A number of chosen problems will be solved to illustrate the concepts clearly. (Demonstration purpose only, not to be included in examination).					
Contact Periods:					
Lecture: 15 Periods Tutorial: 0 Periods Practical: 60 Periods Total: 75 Periods					

TEXT BOOKS:

1	<i>K.Venugopal, “Engineering Graphics”, New Age International (P) Limited, 2016.</i>
2	<i>K.V.Natarajan, “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2016.</i>

REFERENCES:

1	<i>K.L.Narayana and P.Kannaiah, "Text book on Engineering Drawing", 2nd Edition, SciTech Publications (India) Pvt. Ltd, Chennai, 2009.</i>
2	<i>N.S.Parthasarathy and Vela Murali, "Engineering Graphics", Oxford University Press, New Delhi, 2015.</i>
3	<i>K.R.Gopalakrishna, "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 2014.</i>
4	<i>Basant Agarwal and C.M.Agarwal, "Engineering Drawing", Tata McGraw Hill Publishers, New Delhi, 2013.</i>
5	<i>Kevin Lang and Alan J.Kalameja, "AutoCAD 2012 Tutor for Engineering Graphics", Cengage Learning Publishers, 1st Edition, 2011.</i>

COURSE OUTCOMES:		Bloom's Taxonomy Mapped
Upon completion of the course, the students will be able to:		
CO1	Acquire on representing solids as per international standards.	K3
CO2	Impart knowledge on different types of projections.	K3
CO3	Generate and interrupt the true shape of section.	K3
CO4	Develop the various surfaces according to the standards.	K3
CO5	Know the concept of computers in drafting engineering diagrams.	K6

COURSE ARTICULATION MATRIX														
COs/ POs	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
CO1	3	1	1	1	1	-	-	-	-	2	-	1	2	2
CO2	3	1	1	1	1	-	-	-	-	2	-	1	1	2
CO3	3	1	1	1	1	-	-	-	-	2	-	1	1	1
CO4	3	1	1	1	1	-	-	-	-	2	-	1	2	2
CO5	3	1	1	1	1	-	-	-	-	2	-	1	2	3
22BES1Z2	3	1	1	1	1	-	-	-	-	2	-	1	2	2

1 – Slight, 2 – Moderate, 3 – Substantial

22BHS2Z4	தமிழரும் தொழில் நுட்பமும் TAMILS AND TECHNOLOGY (Common to all Branches)	SEMESTER II
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	HSMC	1	0	0	1

Course Objectives	
UNIT – I	WEAVING AND CERAMIC TECHNOLOGY 3 Periods
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW)– Graffiti on Potteries.	
UNIT – II	DESIGN AND CONSTRUCTION TECHNOLOGY 3 Periods
Designing and Structural construction House & Designs in household materials during Sangam Age- Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.	
UNIT – III	MANUFACTURING TECHNOLOGY 3 Periods
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beads - Archeological evidences - Gem stone types described in Silappathikaram.	
UNIT – IV	AGRICULTURE AND IRRIGATION TECHNOLOGY 3 Periods
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thooppu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.	
UNIT – V	SCIENTIFIC TAMIL & TAMIL COMPUTING 3 Periods
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.	
Contact Periods: Lecture: 15 Periods Tutorial:0 Periods Practical:0 Periods Total: 15 Periods	

TEXT BOOK:

1	தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2	கணிணித்தமிழ் – முனைவர் இல.சுந்தரம் . (விகடன் பிரசுரம்).
3	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4	பொருளை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

REFERENCES:

1	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:International Institute of Tamil Studies.
3	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)(Published by: International Institute of Tamil Studies).
4	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by:International Institute of Tamil Studies.)
5	Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by:Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)
6	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay)(Published by: The Author)
7	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
8	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) –Reference Book.

COURSE OUTCOMES:		Bloom’s Taxonomy Mapped
Upon completion of the course, the students will be able to:		
CO1		
CO2		
CO3		
CO4		
CO5		

COURSE ARTICULATION MATRIX															
COs/POs	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															
CO2															
CO3															
CO4															
CO5															
22BHS2Z4															
1 – Slight, 2 – Moderate, 3 – Substantial															

22BHS2Z4	தமிழரும் தொழில் நுட்பமும் TAMILS AND TECHNOLOGY (Common to all Branches)	SEMESTER II
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	HSMC	1	0	0	1

Course Objectives	1.				
அலகு I	நெசவு மற்றும் பானைத் தொழில்நுட்பம்	3 Periods			
சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள்- பாண்டங்களில் கீறல் குறியீடுகள்.					
அலகு II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	3 Periods			
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு- சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும்- சிலப்பதிகாரத்தில் மேடைஅமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும்-சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள்-மாதிரிகட்டமைப்புகள் பற்றி அறிதல் , மதுரை மீனாட்சிஅம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர்மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை.					
அலகு III	உற்பத்தித் தொழில் நுட்பம்	3 Periods			
கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் –நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைககள்.					
அலகு IV	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்	3 Periods			
அணை, ஏரி, குளங்கள் , மதகு – சோழர்காலக் குழுழித்தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார்அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு –அறிவுசார் சமூகம்.					
அலகு V	அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்	3 Periods			
அறிவியல் தமிழின் வளர்ச்சி- கணினித்தமிழ் வளர்ச்சி- தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.					
Contact Periods:					
Lecture: 15 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 15 Periods					

TEXT BOOK:

1	தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2	கணினித்தமிழ் - முனைவர் இல.சுந்தரம் . (விகடன் பிரசுரம்).
3	கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4	பொருதை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

REFERENCES:

1	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:International Institute of Tamil Studies).
3	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)(Published by: International Institute of Tamil Studies).
4	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by:International Institute of Tamil Studies.)
5	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by:Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)
6	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay)(Published by: The Author)
7	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
8	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) –Reference Book.

COURSE OUTCOMES: Upon completion of the course, the students will be able to:		Bloom's Taxonomy Mapped
CO1		
CO2		
CO3		
CO4		
CO5		

COURSE ARTICULATION MATRIX															
COs/POs	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															
CO2															
CO3															
CO4															
CO5															
22BHS2Z4															
1 – Slight, 2 – Moderate, 3 – Substantial															

22BHS2Z5	PROFESSIONAL ENGLISH <i>(Common to all Branches)</i>	SEMESTER II
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	HSMC	2	1	0	3

Course Objectives	1. To engage learners in meaningful language activities to improve their LSRW skills 2. To enhance learners' awareness of general rules of writing for specific audiences 3. To help learners understand the purpose, audience, contexts of different types of writing 4. To develop analytical thinking skills for problem solving in communicative contexts 5. To demonstrate an understanding of job applications and interviews for internship and placements				
UNIT – I	FUNDAMENTALS OF COMMUNICATION				9 Periods
Listening–Listening to Personal Introduction and Filling a form Speaking - Self Introduction; Introducing someone in a formal context Reading -Reading Biographies/ Autobiographies and E-mails relevant to technical contexts. Writing - Writing Biographies/ Autobiographies; Drafting Professional E-mails. Grammar - Present Tense (Simple Present, Present Progressive, Present Perfect, Present Perfect Continuous); Parts of Speech Vocabulary - Word Formation with Prefixes; Antonyms; Portmanteau Words					
UNIT – II	SUMMATION AND PROBLEM SOLVING				9 Periods
Listening - Listening to Short-Stories / Personal Experiences/Watching Movies. Speaking-Narrating Personal Experiences / Events and Short Stories Reading - Reading Travelogues and Books. Writing - Report on an event (Field Trip, Industrial Visit, Educational Tours etc.), Review on Books and Movies. Grammar –Past Tense (Simple Past, Past Progressive, Past Perfect, Past Perfect Continuous); Impersonal Passive Vocabulary - Word Formation with suffixes; Synonyms; Phrasal Verbs.					
UNIT– III	DESCRIPTION OF A PROCESS / PRODUCT				9 Periods
Listening - Listening to Digital Marketing Advertisements for Product /Process Descriptions Speaking –Describing/Interpreting a Picture; Giving instructions to use the product. Reading – Reading Advertisements, Gadget Reviews; User Manuals. Writing - Writing Definitions; Product /Process Description; Transcoding; Content Writing Grammar -Future Tense(Simple Future, future continuous, Future Perfect, Future Perfect Continuous); If Clauses Vocabulary - Homonyms; Homophones, One Word Substitutes.					
UNIT– IV	EXPRESSION				9 Periods
Listening – Listening to/Watching Formal Job interviews or Celebrity Interviews Speaking – Participating in a Face to Face or Virtual Interview (Job/Celebrity Interview), virtual interviews Reading – Company profiles, Statement of Purpose, (SOP), Excerpts of interview with professionals from Newspaper, Magazine and other Resources Writing – Job / Internship Application – Cover letter & Resume Grammar – Question types: ‘Wh’ / Yes or No/ and Tags; Subject- Verb Agreement. Vocabulary – Idiomatic Expressions					
UNIT – V	PUBLIC SPEAKING				9 Periods
Listening – Listening to Ceremonious Speeches on You Tube and Jotting down phrases Speaking – Delivering Welcome Address; Introducing the Chief-Guest; Proposing Vote of Thank and Felicitation Reading – Excerpts of Speeches from Newspaper, Magazines and Motivational Books					

Writing – Drafting a Welcome Address, Introduction to the Chief-Guest, Vote of Thanks and Felicitation
 Grammar –Common Errors
 Vocabulary – Commonly Confused Words

Contact Periods:

Lecture: 30 Periods Tutorial: 15 Periods Practical: 0 Periods Total: 45 Periods

TEXT BOOK

1	<i>English for Science & Technology</i> Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.
2	<i>Communicative English</i> , Global Publishers, Chennai 2017 by Dr.J.Anbazhagan Vijay

REFERENCES

1	Raman.Meenakshi,Sharma.Sangeeta(2019). Professional English . Oxford University Press. New Delhi.
2	Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi,2003
3	Using English , Orient Blackswan, Chennai, 2017 by Board of Editors
4	OER (Authentic Open Educational Resources)

COURSE OUTCOMES:		Bloom's Taxonomy Mapped
On completion of the course, the students will be able to:		
CO1	Participate in a basic communicative task.	K3
CO2	Analyse problems in order to arrive at feasible solutions and communicate them orally and in the written format.	K3
CO3	Describe a product or process or mechanism.	K2
CO4	Present their opinions in a planned and logical manner, and draft effective resumes in context of job search.	K3
CO5	Deliver speeches at formal functions.	K3

COURSE ARTICULATION MATRIX														
COs/POs	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
CO1	-	-	1	-	-	2	-	-	-	2	-	-	-	1
CO2	-	1	1	-	-	2	-	-	1	2	-	1	-	1
CO3	-	-	-	1	-	-	-	-	-	2	-	-	-	1
CO4	-	-	1	-	-	-	-	-	2	2	-	-	-	1
CO5	-	-	-	-	-	-	-	-	2	2	-	-	-	1
22BHS2Z5	-	1	1	1	-	1	-	-	1	2	-	1	-	1

22BBS205	DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS <i>(Common to all Branches except CSE & IT)</i>	SEMESTER II
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	BS	3	1	0	4

Course Objectives	1. To gain knowledge of methods to solve higher order differential equations with constant and variable coefficients. 2. To be familiar with forming partial differential equations and solving partial differential equations of standard types of first order and homogeneous linear differential equations. 3. To be familiar with numerical interpolation, numerical differentiation and numerical integration. 4. To acquire the knowledge of numerical solution to first order ordinary differential equations using single and multi step techniques. 5. To gain the knowledge of numerical solution to second order partial differential equations using explicit and implicit methods.				
UNIT – I	ORDINARY DIFFERENTIAL EQUATIONS			9+3 Periods	
Higher order linear differential equations with constant coefficients -variable coefficients: Cauchy-Euler equation, Cauchy-Legendre equation-Method of variation of parameters-Simultaneous first order linear equations with constant coefficients.					
UNIT – II	PARTIAL DIFFERENTIAL EQUATIONS			9+3 Periods	
Formation of partial differential equations – First order partial differential equations – Standard types and Lagrange’s type – Homogeneous linear partial differential equation of second and higher order with constant coefficients.					
UNIT – III	INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION			9+3 Periods	
Solution of polynomial and transcendental equations: Newton-Raphson method-Interpolation with equal interval: Newton’s forward and backward difference formulae-Interpolation with unequal intervals: Lagrange’s formulae-Numerical Differentiation: Newton’s formulae-Numerical integration: Trapezoidal rule and Simpson’s 1/3rd and 3/8 rules.					
UNIT – IV	NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS			9+3 Periods	
First order ordinary differential equations: Taylor’s series method-Euler and modified Euler’s methods-Runge- Kutta method of fourth order -Milne’s and Adam’s predictor-corrector methods.					
UNIT – V	NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS			9+3 Periods	
Partial differential equations: Finite difference method for two dimensional Laplace equation and Poisson equation- Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank-Nicholson methods)-Finite difference explicit method for wave equation.					
Contact Periods:					
Lecture: 45 Periods		Tutorial: 15 Periods		Practical: 0 Periods	
Total: 60 Periods					

TEXT BOOK

1	<i>Veerarajan.T, “Engineering Mathematics”, Revised Edition 2018, McGraw Hill Education (India) Private Limited</i>
2	<i>P. Kandasamy, K. Thilagavathy, K. Gunavathi, “ Numerical Methods”, S. Chand & Company, 3rd Edition, Reprint 2013.</i>

REFERENCES

1	<i>B.S.Grewal, “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 44th Edition, 2018.</i>
2	<i>SrimantaPal, “Numerical Methods Principles, Analyses and Algorithms”, Oxford University Press, New Delhi, 1st Edition 2009.</i>
3	<i>Raisinghania.M.D, “Ordinary And Partial Differential Equations”, 20th Edition, S. Chand Publishing,2020</i>
4	<i>S.S. Sastry, “Introductory methods of numerical analysis”, PHI, New Delhi, 5th Edition, 2015.</i>
5	<i>Ward Cheney, David Kincaid, “Numerical Methods and Computing, Cengage Learning, Delhi, 7th Edition 2013.</i>
6	<i>S. Larsson, V. Thomee, “Partial Differential Equations with Numerical Methods”, Springer, 2003.</i>

COURSE OUTCOMES:		Bloom’s Taxonomy Mapped
Upon completion of the course, the students will be able to:		
CO1	Solve higher order linear differential equation with constant and variable coefficients and simultaneous differential equation.	K5
CO2	Form partial differential equations and find solutions of first and higher order partial differential equations.	K5
CO3	Obtain approximate solutions for transcendental equations and problems on interpolation, differentiation, integration.	K5
CO4	Find the numerical solutions of first order ordinary differential equations using single and multi step techniques.	K5
CO5	Solve second order partial differential equations using explicit and implicit methods.	K5

COURSE ARTICULATION MATRIX														
COs/POs	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
CO1	3	3	-	1	-	-	-	-	-	-	-	1	3	-
CO2	3	3	-	1	-	-	-	-	-	-	-	1	3	-
CO3	3	3	-	1	-	-	-	-	-	-	-	1	3	-
CO4	3	3	-	1	-	-	-	-	-	-	-	1	3	-
CO5	3	3	-	1	-	-	-	-	-	-	-	1	3	-
22BBS205	3	3	-	1	-	-	-	-	-	-	-	1	3	-
1 – Slight, 2 – Moderate, 3 – Substantial														

22BES203	PROGRAMMING IN C <i>(Common to all Branches except MECH & PRODN)</i>	SEMESTER II
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	ES	3	0	0	3

Course Objectives	<ol style="list-style-type: none"> 1. To study the basic concepts of computer and programming fundamentals. 2. To understand the data types in C , flow control statements, Arrays, Functions Pointers, Structures, Unions and File concepts in C.
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UNIT – I	COMPUTER AND PROGRAMMING FUNDAMENTALS	(9 Periods)
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Computer fundamentals – Evolution, classification, Anatomy of a computer: CPU, Memory, I/O – Introduction to software –Classification of programming languages – Compiling –Linking and loading a program – Introduction to OS – Types of OS.

UNIT – II	DATATYPES AND FLOW OF CONTROL	(9 Periods)
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Structured programming – Algorithms – Structure of a C program – Variables – Data types – Operators and expressions – Input and Output statements – Tokens –Type Conversion – Control statements.

UNIT – III	ARRAYS AND FUNCTIONS	(9 Periods)
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1D Arrays– 2D Arrays – Multidimensional Arrays – Strings – String handling functions – Functions – Recursion – Array as function arguments – Storage Classes – Enumerations.

UNIT – IV	POINTERS	(9 Periods)
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Introduction to pointers – Pointers arithmetic – call by reference – Relationship between Array and Pointers – Relationship between String and pointers – pointers to pointers – array of pointers – pointers to an array – Dynamic memory allocation – Arguments to main().

UNIT – V	STRUCTURES AND UNIONS, FILE OPERATIONS	(9 Periods)
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Preprocessor directives – Structures – Unions – Bit fields – Opening and closing a file – Working with file of records – Random access to file of records.

Contact Periods:
Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

TEXT BOOK

1	<i>PradipDey, Manas Ghosh, “Computer Fundamentals and Programming in C”, Second Edition, Oxford University Press, 2018.</i>
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REFERENCES

1	<i>Al Kelley, Ira Pohl ,“A Book on C- Programming in C ”, Fourth Edition, Addison Wesley, 2001.</i>
2	<i>Herbert Schildt ,“C: The Complete Reference”, Fourth Edition, McGraw Hill Education, 2017.</i>
3	<i>Yashavant P.Kanetkar,“ Let Us C”,15th edition,BPB Publications,2016.</i>
4	<i>Brian W. Kernighan and Dennis Ritchie, “The C Programming Language”, Second Edition, Prentice Hall Software Series, 2015.</i>

COURSE OUTCOMES:		Bloom's Taxonomy Mapped
Upon completion of the course, the students will be able to:		
CO1	Articulate the basics of computer and evolution of programming languages.	K1
CO2	Write simple C programs using appropriate datatypes and control statements	K3
CO3	Write C programs using arrays , functions and enumerations	K3
CO4	Use pointers effectively to develop programs	K3
CO5	Create user defined datatypes using structures & union and effectively manipulate them in file operations.	K6

COURSE ARTICULATION MATRIX														
COs/POs	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	1	-	-	-	-	-	-	-	-	-	1	1	-
CO2	-	1	1	-	-	-	-	-	-	-	-	1	1	-
CO3	-	1	1	-	-	-	-	-	-	-	-	1	1	-
CO4	1	1	1	-	-	-	-	-	-	-	-	1	1	-
CO5	-	1	1	-	-	-	-	-	-	-	-	1	1	-
22BES203	1	1	1	-	-	-	-	-	-	-	-	1	1	-

1 – Slight, 2 – Moderate, 3 – Substantial

22BPC201	BIOCHEMISTRY-I	SEMESTER II
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	PC	3	0	0	3

Course Objectives	1. To identify the different classes of polymeric biomolecules and their monomeric building blocks. 2. To comprehend the properties of carbohydrates proteins, lipids, and nucleic acids 3. To understand the functional properties of carbohydrates proteins, lipids, and nucleic acids in the biological system 4. To know the basic information on structural and cytoskeletal biomolecules 5. To determine the levels of protein structures and their stability				
UNIT – I	INTRODUCTION	9 periods			
Covalent and non-covalent interactions in biological molecules, Water – properties of water, hydrophobic effect, Water as a reactant, pH buffers, Acid-base reactions in biochemical processes, Maintenance of blood pH, Versatility of carbon bonding, Some common functional groups of biomolecules.					
UNIT – II	CARBOHYDRATES	9 periods			
Carbohydrates- Classification, Structure and Properties of Carbohydrates (Mono, Di, Oligo & Starch, glycogen and cellulose) - Mutarotation, Hexose derivatives, Reducing sugars, Glycosidic Bond, Conjugated carbohydrates; Proteoglycans - glycosaminoglycans and lipopolysaccharides -Bacterial lipopolysaccharides.					
UNIT – III	LIPIDS	9 periods			
Structure and properties of lipids – Classification, (Fatty acids, Glycerolipids, Phospholipids, Glycolipids, Sphingolipids, Steroids), Structure of vitamins and non-peptide hormones.					
UNIT – IV	NUCLEIC ACIDS	9 periods			
Nucleic Acids – Structure of Purines, Pyrimidines, Nucleosides, Nucleotides, Ribonucleic acids – Structure and Classification, Deoxyribonucleic acids – Structure of DNA, Nucleoprotein complexes.					
UNIT – V	PROTEINS	9 periods			
Classification of Amino acids, Structure and Properties of Amino acids-peptide bond, Classification of Proteins-Primary- Secondary structures-alpha helix, beta-sheet and turns, Tertiary and Quaternary structure of proteins, Fibrous and globular proteins, Ramachandran plot.					
Contact Periods:					
Lecture:45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods					

TEXT BOOKS

1	<i>APA. Nelson, D. L., & Cox, M. M., “Lehninger’s —Principles of Biochemistry”, 7th Edition, Macmillan, 2017.</i>
2	<i>Voet, Donald, Judith G. Voet, and Charlotte W. Pratt., “Fundamentals of Biochemistry: Life at the Molecular Level”, 5th Edition, Wiley., 2016.</i>

REFERENCES BOOKS

1	<i>Victor W. Rodwell; David Bender; Kathleen M. Botham; Peter J. Kennelly; P. Anthony Weil., “Harper’s Illustrated Biochemistry”, 31st Edition, McGraw-Hill Education, 2018.</i>
2	<i>Berg, J.M., Tymoczko, J.L., Stryer, L., “Biochemistry”, 9th Edition, WH Freeman, 2019.</i>

COURSE OUTCOMES: Upon completion of the course, the students will be able to:		Bloom's Taxonomy Mapped
CO1	Comprehend the role of chemistry in a biological system	K1
CO2	Classify bio-molecules based on their chemical properties	K1
CO3	Infer the structure and properties of macromolecules	K2
CO4	Interpret the levels of macromolecular organization	K2
CO5	Realize the significance of complex biomolecules	K2

COURSE ARTICULATION MATRIX														
COs/POs	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
CO1	1	1	-	-	-	-	-	-	-	-	-	-	3	2
CO2	1	1	-	-	-	-	-	-	-	-	-	-	3	2
CO3	1	1	1	-	-	-	-	-	-	-	-	-	3	2
CO4	1	1	-	-	-	-	-	-	-	-	-	-	3	2
CO5	1	1	-	-	-	-	-	-	-	-	-	-	2	3
22BPC201	1	1	1	-	-	-	-	-	-	-	-	-	3	2
1 – Slight, 2 – Moderate, 3 – Substantial														



22BMC2Z1	ENVIRONMENTAL SCIENCE AND ENGINEERING (Common to all Branches)	SEMESTER II
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	MC	3	0	0	0

Course Objectives	<ol style="list-style-type: none"> 1. To study the modern agriculture related problems, natural resources and its harnessing methods. 2. To study the interrelationship between living organism and environment. 3. To educate the people about causes of pollutions and its controlling methods. 4. To impart the knowledge of various environmental threats and its consequences. 5. To study the various water conservation methods, Act, Population policy, Welfare programs. 				
UNIT – I	ENVIRONMENTAL ENERGY RESOURCES	9 Periods			
Food-effects of modern agriculture, fertilizers, pesticides, eutrophication & biomagnifications-Energy resources: renewable resources - Hydro Energy, Solar & Wind. Non-renewable resources – Coal and Petroleum - harnessing methods.					
UNIT – II	ECO SYSTEM AND BIODIVERSITY	9 Periods			
Eco system and its components - biotic and abiotic components. Biodiversity: types and values of biodiversity, hot spots of biodiversity, endangered and endemic species, conservation of biodiversity: In situ and ex situ conservation. Threats to biodiversity-destruction of habitat, habit fragmentation, hunting, over exploitation and man-wildlife conflicts. The IUCN red list categories.					
UNIT – III	ENVIRONMENTAL POLLUTION	9 Periods			
Air pollution, classification of air pollutants – sources, effects and control of gaseous pollutants SO ₂ , NO ₂ , H ₂ S, CO, CO ₂ and particulates. Water pollution - classification of water pollutants, organic and inorganic pollutants, sources, effects and control of water pollution. Noise pollution - decibel scale, sources, effects and control.					
UNIT – IV	ENVIRONMENTAL THREATS	9 Periods			
Global warming-measure to check global warming - impacts of enhanced Greenhouse effect, Acid rain-effects and control of acid rain, ozone layer depletion- effects of ozone depletion, disaster management - flood, drought, earthquake and tsunami.					
UNIT – V	SOCIAL ISSUES AND ENVIRONMENT	9 Periods			
Water conservation, rain water harvesting, e-waste management, Pollution Control Act, Wild life Protection Act. Population growth- exponential and logistic growth, variation in population among nations, population policy. Women and Child welfare programs. Role of information technology in human and health, COVID-19 - effects and preventive measures.					
Contact Periods:					
Lecture:45 Periods Tutorial: 0 Periods Practical: 0 Periods Total:45 Periods					

TEXT BOOK:

1	Sharma J.P., “ Environmental Studies ”, 4 th Edition, University Science Press, New Delhi 2016.
2	Anubha Kaushik and C.P.Kaushik, “ Environmental Science and Engineering ”, 7 th Edition, New Age International Publishers, New Delhi, 2021.

REFERENCES:

1	<i>A K De, “Environmental Chemistry”, 8th Edition, New Age International Publishers, 2017.</i>
2	<i>G. Tyler Miller and Scott E. Spoolman, “Environmental Science”, Cengage Learning India Pvt, Ltd, Delhi, 2014.</i>
3	<i>ErachBharucha, “Textbook of Environmental Studies”, Universities Press(I) Pvt, Ltd, Hyderabad, 2015.</i>
4	<i>Gilbert M.Masters, “Introduction to Environmental Engineering and Science”, 3rd Edition, Pearson Education, 2015.</i>

COURSE OUTCOMES:		Bloom’s Taxonomy Mapped
Upon completion of the course, the students will be able to:		
CO1	Recognize and understand about the various environmental energy resources and the effective utility of modern agriculture.	K2
CO2	Acquire knowledge about the interaction of biosphere with environment and conservation methods of bio diversity.	K2
CO3	Be aware of the sources of various types of pollution, their ill effects and preventive methods.	K2
CO4	Identify and take the preventive measures to control the environmental threats and effects of Global warming, Ozone depletion, Acid rain, and natural disasters.	K2
CO5	Demonstrate an idea to save water and other issues like COVID -19.	K2

COURSE ARTICULATION MATRIX																
COs/POs	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	1	1	-	1	1	-	3	-	-	-	-	1	1	-	-	
CO2	1	-	-	1	1	2	2	-	-	-	-	1	1	-	-	
CO3	1	1	1	1	1	2	3	-	-	-	-	1	2	-	-	
CO4	1	1	1	1	1	2	3	-	-	-	-	1	1	-	-	
CO5	1	1	1	1	1	2	2	-	-	1	-	1	2	-	-	
22BMC2Z1	1	1	1	1	1	2	3	-	-	1	-	1	1	-	-	

1 – Slight, 2 – Moderate, 3 – Substantial

22BBS2Z6	PHYSICS LABORATORY <i>(Common to all Branches)</i>	SEMESTER II
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	BS	0	0	3	1.5

Course Objectives	<ol style="list-style-type: none"> 1. To impart practical knowledge on the concept of properties of matter and utilize the experimental techniques to measure the properties 2. To impart practical knowledge on the moduli of elasticity 3. To analyze the properties of semiconductors 4. To learn practically the basic electronic concepts of transistor and logic gates 5. To realize the principle, concepts and working of a solar cell and study the properties of ferromagnetic material 6. To understand the concept of quantum physics
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S. No.	LABORATORY EXPERIMENTS
1.	Determination of refractive index of the glass and given liquid – Spectrometer diffraction method.
2.	Determination of Planck's constant.
3.	Determination of Young's Modulus of the material in the form of bar – Cantilever Bending - Koenig's Method.
4.	a) Particle size determination using diode laser. b) Determination of numerical aperture and acceptance angle in an optical fiber.
5.	Hall effect - Determination of semiconductor parameters.
6.	Determination of band gap of semiconductor material.
7.	Determination of velocity of sound and compressibility of the given liquid-Ultrasonic Interferometer.
8.	Determination of moment of inertia of disc and rigidity modulus of a wire-Torsional pendulum.
9.	Transistor characteristics.
10.	Solar cell characteristics.
11.	Determination of Hysteresis losses in a Ferromagnetic material-B-H curve unit.
12.	Logic Gates – Verification and Construction.
Contact Periods:	
Lecture: 0 Periods Tutorial: 0 Periods Practical: 45 Periods Total: 45 Periods	

COURSE OUTCOMES:		Bloom's Taxonomy Mapped
Upon completion of the course, the students will be able to:		
CO1	Determine refractive index and compressibility of liquids, micro size of particles and numerical aperture of an optical fibre	K5
CO2	Measure the Young's and rigidity moduli of the given material	K5
CO3	Determine the bandgap of a given semiconductor material and identify the type of semiconductor and its carrier concentration through Hall measurement	K5
CO4	Analyze the characteristics of transistor and verify the truth table of logic gates	K4
CO5	Measure the efficiency of a solar cell and energy loss associated with the ferromagnetic material by plotting B-H curve	K5
CO6	Determine the Planck's constant and work function	K5

COURSE ARTICULATION MATRIX														
COs/POs	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
CO1	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO6	2	-	-	-	-	-	-	-	-	-	-	-	1	-
22BBS2Z6	2	-	-	-	-	-	-	-	-	-	-	-	1	-
1 – Slight, 2 – Moderate, 3 – Substantial														



22BES2Z4	WORKSHOP PRACTICE <i>(Common to all Branches)</i>	SEMESTER II
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	ES	0	0	3	1.5

Course Objectives	<ol style="list-style-type: none"> 1. To make various basic prototypes in the carpentry trade such as Half Lap joint, Lap Tee joint, Dovetail joint, Mortise & Tenon joint. 2. To make various welding joints such as Lap joint, Lap Tee joint, Edge joint, Butt joint and Corner joint. 3. To make various moulds in foundry such as Cube, Straight pipe, V pulley, and Conical bush. 4. To make various components using sheet metal such as Tray, Frustum of cone and Square box. 5. To understand the working and identify the various components of CNC Machines.
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LIST OF EXPERIMENTS			
<ol style="list-style-type: none"> 1. Introduction to use of tools and equipment's in Carpentry, Welding, Foundry and Sheet metal. 2. Safety aspects in Welding, Carpentry, Foundry and sheet metal. 3. Half Lap joint and Dovetail joint in Carpentry. 4. Welding of Lap joint and Butt joint and T-joint. 5. Preparation of Sand mould for Cube, Conical bush, Pipes and V pulley. 6. Fabrication of parts like Tray, Frustum of cone and Square box in sheet metal. 7. CNC Machines demonstration and lecture on working principle. 8. Electrical wiring and simple house wiring. 			
Contact periods:			
Lecture: 0 Periods	Tutorial: 0 Periods	Practical: 45 Periods	Total: 45 Periods

COURSE OUTCOMES:		Bloom's Taxonomy Mapped
Upon completion of the course, the students will be able to:		
CO1	Safely Use tools and equipment's used in Carpentry, Welding, Foundry and Sheet metal to create basic joints.	K2
CO2	Prepare sand mould for various basic pattern shapes.	K3
CO3	Fabricate parts like Tray, Frustum of cone and Square box in sheet metal.	K3
CO4	Practice on the Welding and Carpentry	K3
CO5	Demonstrate the working of CNC Machines.	K2

COURSE ARTICULATION MATRIX														
COs/ POs	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
CO1	-	-	1	-	-	3	1	1	-	2	-	1	-	2
CO2	2	-	3	-	-	3	3	1	-	3	2	1	-	2
CO3	2	-	3	-	-	3	3	1	-	3	2	1	-	2
CO4	2	-	3	-	-	3	3	1	-	3	2	1	-	2
CO5	-	-	-	-	1	-	-	-	-	2	-	1	-	2
22BES2Z4	1	-	2	-	1	2	2	1	-	3	1	1	-	2
1 – Slight, 2 – Moderate, 3 – Substantial														

22BES205	PROGRAMMING IN C LABORATORY <i>(Common to all Branches except Mech&Prodn)</i>	SEMESTER II
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	ES	0	0	3	1.5

COURSE OBJECTIVES:

To understand the concepts like Data types, Flow control statements, Functions, Arrays, command line arguments, Pointer, Dynamic memory allocation, Preprocessor Directives, Structures, Unions and Files in C

EXERCISES ILLUSTRATING THE FOLLOWING CONCEPTS:

1	Operators, Expressions and IO formatting
2	Decision Making and Looping
3	Arrays and Strings
4	Functions and Recursion
5	Pointers
6	Dynamic Memory Allocation
7	Command line arguments
8	Preprocessor Directives
9	Structures
10	Unions
11	Files
12	Mini Project

Contact periods:

Lecture: 0 Periods	Tutorial: 0 Periods	Practical: 45 Periods	Total: 45 Periods
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COURSE OUTCOMES:

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

		Bloom's Taxonomy Mapped
CO1	Use appropriate data types and flow control statements to write C programs	K6
CO2	Write C programs using arrays , functions and command line arguments	K6
CO3	Write C programs using pointers, dynamic memory allocation and preprocessor directives	K6
CO4	Implement user defined data types using structures & union and effectively manipulate them in file operations.	K6
CO5	Develop simple applications using C	K6

COURSE ARTICULATION MATRIX														
COs/POs	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
CO1	-	2	1	-	-	-	-	-	-	-	-	-	1	-
CO2	-	2	1	-	-	-	-	-	-	-	-	-	1	-
CO3	-	2	1	-	-	-	-	-	-	-	-	-	1	-
CO4	-	2	1	-	-	-	-	-	-	-	-	-	1	-
CO5	1	2	2	1	-	-	-	-	3	3	-	-	1	-
22BES205	1	2	1	1	-	-	-	-	1	1	-	-	1	-
1 – Slight, 2 – Moderate, 3 – Substantial														

