Pondicherry Engineering College, Puducherry – 605014

(An Autonomous Institution of Government of Puducherry affiliated to Pondicherry University)

Curriculum and Syllabi

For

B.Tech. First Year

(With Effect from Academic year 2018-19)

(Approved in Fourth Academic Council Meeting held on 8th December 2018)

Curriculum

Semester I

Group-I (CS1, CS2, IT1, ME1, ME2, CH1)

Course Code	Course	CCC	SET	Periods			Credits
				L	T	P	
FY201	Induction Programme	MCC	-	-	-	-	0
MA201	Mathematics-I	BSC	TY	3	1	0	4
PH201	Physics	BSC	TY	3	1	0	4
CY201	Chemistry	BSC	TY	3	1	0	4
HS201	English for Communication	HSM	TY	2	0	2	3
ME201	Workshop and Manufacturing Practice	ESC	LB	0	0	3	1.5
PH202	Physics Laboratory	BSC	LB	0	0	3	1.5
CY202	Chemistry Laboratory	BSC	LB	0	0	3	1.5
Total				11	3	11	-
				25			19.5

Group-II (EC1, EC2, EE1, EI1, CE1, CE2)

Course Code	Course	CCC	SET	Periods			Credits
				L	T	P	
FY201	Induction Programme	MCC	-	-	-	-	0
MA201	Mathematics-I	BSC	TY	3	1	0	4
EE201	Basic Electrical Engineering	ESC	TY	3	1	0	4
CS201	Programming for Problem Solving	ESC	TY	3	0	0	3
ME202	Engineering Graphics and Computer Aided Drawing	ESC	TY	2	0	4	3
CE201	Environmental Science	MCC	-	3	0	0	0
EE202	Basic Electrical Engineering Laboratory	ESC	LB	0	0	3	1.5
CS202	Programming Laboratory	ESC	LB	0	0	3	1.5
Total				14	2	10	-
				26			17

CCC - Course Category Code, **SET** – Semester Exam Type, **TY** – Theory, **LB** – Laboratory, **PR** - Project

Semester II

Group-I (CS1, CS2, IT1, ME1, ME2, CH1)

Course Code	Course	CCC	SET	Periods			Credits
				L	T	P	
MA202	Mathematics-II	BSC	TY	3	1	0	4
EE201	Basic Electrical Engineering	ESC	TY	3	1	0	4
CS201	Programming for Problem Solving	ESC	TY	3	0	0	3
ME202	Engineering Graphics and Computer Aided Drawing	ESC	TY	2	0	4	3
CE201	Environmental Science	MCC	-	3	0	0	0
EE202	Basic Electrical Engineering Laboratory	ESC	LB	0	0	3	1.5
CS202	Programming Laboratory	ESC	LB	0	0	3	1.5
Total				14	2	10	-
				26			17

Group-II (EC1, EC2, EE1, EI1, CE1, CE2)

Course Code	Course	CCC	SET	Periods			Credits
				L	T	P	
MA202	Mathematics-II	BSC	TY	3	1	0	4
PH201	Physics	BSC	TY	3	1	0	4
CY201	Chemistry	BSC	TY	3	1	0	4
HS201	English for Communication	HSM	TY	2	0	2	3
ME201	Workshop and Manufacturing Practice	ESC	LB	0	0	3	1.5
PH202	Physics Laboratory	BSC	LB	0	0	3	1.5
CY202	Chemistry Laboratory	BSC	LB	0	0	3	1.5
Total				11	3	11	-
				25			19.5

CCC - Course Category Code, **SET** – Semester Exam Type, **TY** – Theory, **LB** – Laboratory, **PR** - Project

Department : **First year**			Programme: **B.Tech**					
Semester : **First**			Course Category Code: **MCC**			Semester Exam Type: -		
Course Code	Course	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
FY201	**Induction Programme**	-	-	-	Non-Credit	-	-	-
Prerequisite	**-**							
Course Outcome	The course will enable the student to							
	CO1	Acquire social awareness & knowledge for self-development						
	CO2	Be aware of nature & environment conscious and of Innovative nature.						
	CO3	Develop holistic attitude and harmony in the individual, family, and society						
	CO4	Know about the art and culture, language and literature of this vast secular nation						
	CO5	Integrating technical Education for betterment of society						
UNIT-I	**Proficiency in English**				**Periods: 12**			
Communication skills – Diagnostic test on Grammar – Synonyms, Antonyms, Tenses, Sentence Completion, Idioms & Phrases, One word substitution, Homophones, Homonyms, Use of Prepositions, Subject-verb agreement – Writing – Paragraph writing, Letter writing, Essay writing, Story Development.								**CO1**
UNIT-II	**Bridge course in Mathematics**				**Periods: 12**			
Fundamentals of differential and integral calculus: Theory, Practice & Test. Limit of function-Fundamental results on limits-Continuity of a function- Concept of differentiation- Concept of derivative- Slope of a curve-Differentiation Techniques- Derivatives of elementary functions from first principle-Derivatives of inverse functions-Logarithmic differentiation- Method of substitution- Differentiation of parametric functions-Differentiation of implicit functions- Higher order derivatives. Integrals of functions containing linear functions-Method of integration (Decomposition method, method of substitution, integration by parts) - Definite integrals. Simple definite integrals- Properties of Definite integrals- Reduction formulae-Area and volume- Length of curve- surface area of a solid.								**CO2**
UNIT-III	**Universal human values**				**Periods: 12**			
Current Status of the society (Sources of fear)-Reformation through education-Sanskar-What is success (getting good marks, college admission, Job etc)-What is aim of life (happiness, Prosperity and continuity of happiness and prosperity)-What is required for happiness (relationship, physical facilities)-Relationship involves all emotions and feelings-Physical facility-material things required for life-Difference between animal and human consciousness-Animal consciousness-depending on money, accumulating money by wrong means etc.-Human consciousness-right thinking, right understanding, right feeling-Happiness through Harmony in the individual, family, society and nature, leading to fearlessness in the society is the purpose of holistic education or value education.								**CO3**
UNIT-IV	**Literary activities**				**Periods: 12**			
Team building activities – Quiz – Oral Exercises – Group discussion, Debate, Extempore, Role play.								**CO4**
UNIT-V	**Creative arts**				**Periods: 12**			
Introduction to painting & renowned artworks – Documentary & Short films – Music – Vocal, Instrumental – Dance – Classical, Cinematic – Mimicry – Mime.								**CO5**
Lecture Periods: 60	**Tutorial Periods: -**	**Practical Periods: -**			**Total Periods: 60**			
Reference Books								
-								

Department : **Mathematics**		Programme: **B.Tech.**						
Semester : **First**		Course Category Code: **BSC**			Semester Exam Type: **TY**			
Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
MA201	**Mathematics-I**	3	1	-	4	40	60	100
Prerequisite:	-							

Course Outcome	**CO1**	To apply differential calculus to notions of curvature, evolutes and involutes and they will have a basic understanding of Beta and Gamma functions
	CO2	The mathematical tools needed in evaluating multiple integrals and their usage.
	CO3	The effective mathematical tools for the solutions of differential equations that model physical processes
	CO4	Able to solve simultaneous linear differential equations
	CO5	Understands Vector calculus and its applications

UNIT-I	**Differential Calculus**	**Periods: 12**
Curvature, radius of curvature, evolutes and involutes. Beta and Gamma functions and their properties.		**CO1**
UNIT-II	**Multi variable calculus**	**Periods: 12**
Multiple Integrals, change of order of integration in double integrals, Applications: Plane areas (double integration), Change of variables (Cartesian to polar), Double and triple integrations, Volumes by triple integration – Mass, Center of mass and Gravity (constant and variable densities).		**CO2**
UNIT-III	**First order Ordinary Differential Equation**	**Periods: 12**
Exact equations, First order linear equations, Bernoulli's equation, Equations not of first degree, equations solvable for p, equations solvable for y, equations solvable for x - Clairaut's type - simple applications, orthogonal trajectories, growth and decay.		**CO3**
UNIT-IV	**Higher Order Ordinary Differential Equation**	**Periods: 12**
Linear differential equations of higher order - with constant coefficients, the operator D, Euler's linear equation of higher order with variable coefficients, simultaneous linear differential equations, solution by variation of parameters method.		**CO4**
UNIT-V	**Vector Calculus**	**Periods: 12**
Gradient, divergence and curl, their properties and relations. Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integral, Theorems of Green, Stokes and Gauss divergence (without proof). Simple applications involving cubes, sphere and rectangular parallelepipeds.		**CO5**

Lecture Periods: 45	**Tutorial Periods: 15**	**Practical Periods:-**	**Total Periods: 60**

Reference Books:

1. Veerarajan T, Engineering Mathematics I , McGraw-Hill Education(India) Private Limited, 2014
2. Veerarajan T, Engineering Mathematics II , McGraw-Hill Education(India) Private Limited, 2015
3. Venkataraman M.K., Engineering Mathematics, Vol. I&II, The National Publishing Company, Chennai, 2008.
4. Erwin Kreyszig, Advanced Engineering Mathematics (9 th Ed), John Wiley & Sons, New Delhi, 2011.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, Eleventh Reprint, 2010.
6. Bali N. and Goyal M., Advanced Engineering Mathematics, Laxmi Publications Pvt. Ltd., New Delhi, 9thEdition, 2011.

Department : **Mathematics**		Programme : **B.Tech**						
Semester : **Second**		Course Category Code: **BSC**			Semester Exam Type: **TY**			
Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
MA202	**Mathematics-II**	3	1	-	4	40	60	100
Prerequisite:	-							

Course Outcome	**CO1**	Understands Matrix theory
	CO2	The tool of Fourier series for learning advanced Engineering Mathematics
	CO3	The tool of Fourier transform for learning advanced Engineering Mathematics
	CO4	The tools of differentiation of functions of a complex variable that are used in various techniques dealing engineering problems.
	CO5	The tools of integration of functions of a complex variable that are used in various techniques dealing engineering problems.

UNIT-I	**Matrices**	**Periods: 12**
Inverse and rank of a matrix, System of linear equations, Symmetric, Skew Symmetric and Orthogonal matrices, Eigenvalues and Eigenvectors of a real matrix, Characteristic equation, Properties of Eigenvalues. Cayley-Hamilton Theorem (statement only), Diagonalization of matrices.		**CO1**
UNIT-II	**Fourier Series**	**Periods: 12**
Dirichlet's conditions - Expansion of periodic functions into Fourier series- Change of interval- Half-range Fourier series. Complex form of Fourier series - Root mean square value - Parseval's theorem on Fourier coefficients - Harmonic analysis.		**CO2**
UNIT-III	**Fourier Transform**	**Periods: 12**
Fourier Integral Theorem(statement only)- Fourier transform, Inverse Fourier transform, definition and properties - Evaluation of integrals- Fourier cosine and sine transform, definitions and evaluation of integrals using cosine and sine transforms.		**CO3**
UNIT-IV	**Complex Valued function and Conformal Mapping**	**Periods: 12**
Definition of a Complex valued function f(z) and its derivative - Analytic functions -Necessary condition for a function f(z) to be analytic (in Cartesian) - Cauchy-Riemann equation - statement of C-R equation in polar form -sufficient condition for f(z) to be analytic(statement only)- harmonic function- Harmonic and orthogonal properties of analytic function – Construction of analytic functions. Conformal mapping – Simple and standard transformations like $w = z^2$, e^z, z+c, cz, sinz, 1/z, Bilinear transformation (excluding Schwarz- Christoffel transformation).		**CO4**
UNIT-V	**Complex Integration**	**Periods:12**
Cauchy's Integral theorem, Cauchy's integral formula (without proof) and problems, Taylor's and Laurent's theorem (without proof), Classification of singularities. Residues and evaluation of residues – Cauchy's Residue theorem, Contour integration – Evaluation of real integrals – unit circle and semi-circular contour (excluding poles on boundaries).		**CO5**

Lecture Periods: 45	**Tutorial Periods: 15**	**Practical Periods:**	**Total Periods: 60**

Reference Books:

1. Veerarajan T., Engineering Mathematics II , McGraw-Hill Education(India) Private Limited, 2018
2. Veerarajan T., Transforms and Partial Differential Equations , McGraw-Hill Education(India) Private Limited, 2016
3. Venkataraman M.K., Engineering Mathematics, Vol. II and III, The National Publishing Company, 2008.
4. Erwin Kreyszig, Advanced Engineering Mathematics (Ninth Edition), John Wiley & Sons, New Delhi, 2011
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, Eleventh Reprint, 2010.
6. Bali N. and Goyal M., Advanced Engineering Mathematics, Laxmi Publications Pvt. Ltd., New Delhi, Ninth Edition, 2011.

Department : **Physics**				Programme : **B.Tech.**				
Semester : **First/Second**				Course Category Code: **BSC**		Semester Exam Type: **TY**		
Course Code	Course	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
PH201	**Physics**	3	1	-	4	40	60	100
Prerequisite	-							
		The course will enable the student to:						
Course Outcome	**CO1**	Understand electric and magnetic field & potential						
	CO2	Study the basics of dielectric materials and its importance						
	CO3	Understand the concepts of wave mechanics and its applications						
	CO4	To study the optical phenomena arising due to interference, diffraction and polarization						
	CO5	To discuss the fundamentals of Lasers, fiber optics and its real time applications						

UNIT-I	**Electromagnetic theory**	**Periods: 12**
Brief review of electrostatics, electric field and potential – divergence and curl of electrostatic field – Gauss law and its applications, Laplace's equation in one, two and three dimension. Brief review of magnetostatics, Biot-Savart law – divergence and curl of static magnetic field – Ampere's law – magnetic vector potential – comparison of electrostatics and magnetostatics.		**CO1**
UNIT-II	**Dielectrics**	**Periods: 12**
Dielectric polarization and its mechanisms – dielectric loss – dielectric breakdown – calculation of electronic polarizabilities and ionic polarizabilities – temperature and frequency dependence of polarization – internal field in solids – Clausius-Mossotti relation – ferroelectricity – ferroelectric hysteresis.		**CO2**
UNIT-III	**Quantum mechanics**	**Periods: 12**
Matter Waves – de Broglie hypothesis – uncertainty principle – Schrödinger wave equations – time dependent – time independent – physical significance of wave function – application to particle in a one dimensional potential box – concept of quantum mechanical tunneling (without derivation) – applications of tunneling (qualitative) to alpha decay, tunnel diode, scanning tunneling microscope.		**CO3**
UNIT-IV	**Wave optics**	**Periods: 12**
Interference: airwedge – Newton's rings – Michelson's interferometer – types of fringes – determination of wavelength of a light source. **Diffraction:** concept of resolution of spectral lines – Rayleigh's criterion – resolving power of grating, prism & telescope. **Polarisation:** Basic concepts of double refraction – circular and elliptical polarization – quarter and half wave plates – optical rotation – specific rotatory power – Laurent's half shade polarimeter.		**CO4**
UNIT-V	**Lasers and Fiber optics**	**Periods: 12**
Lasers: Principles of laser – spontaneous and stimulated emissions – Einstein's theory of matter radiation interaction – A and B coefficients – population inversion and laser action – optical resonators(qualitative) – types of lasers –Nd:YAG, CO2 laser, GaAs laser – industrial & medical applications of lasers (any two). **Fiber optics:** Principle and propagation of light in optical fiber – numerical aperture and acceptance angle – step index and graded index fiber – qualitative ideas of attenuation in optical fibers – fiber optic communication (schematic), active and passive fiber optic sensors, endoscope.		**CO5**

Lecture Periods: 45	**Tutorial Periods: 15**	**Practical Periods: -**	**Total Periods: 60**

Reference Books

1. David Griffiths, Introduction to Electrodynamics, 3rd Edition, Eastern Economy Edition., 2011
2. A.S. Vasudeva, Modern Engineering Physics, S. Chand & Co, 2006.
3. D. J. Griffiths, "Quantum mechanics", Pearson Education, 2014.
4. V. Rajendran, Engineering Physics, 2nd Edition, TMH, New Delhi 2011
5. Avadhanulu M. N. , Engineering Physics, S. Chand & Co, 2007
6. David Halliday, Robert Resnick and Jearl Walker, Fundamentals of Physics, Wiley publications, 2013
7. H.J. Pain, The physics of vibrations and waves, Wiley publications, 2005
8. Ajoy Ghatak, Optics, 5th Edition TMH, New Delhi, 2012
9. Orazio Svelto, 2nd Edition, plenum Press, Principles of Lasers, 1982.
10. K. Thyagarajan and Ajoy Ghatak, Lasers Fundamentals and Applications, 2nd Edition, Springer 2010.

Department : **Physics**			Programme : **B.Tech.**						
Semester : **First/Second**			Course Category Code: **BSC**			Semester Exam Type: **LB**			
Course Code	Course		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	SE	TM
PH202	**Physics Laboratory**		-	-	3	1.5	40	60	100
Prerequisite	-								
	The students will learn to experimentally measure:								
Course Outcome	**CO1**	Optical parameters related to the concepts included in theoretical curriculum							
	CO2	Characteristic parameters of Laser and optical fiber							
	CO3	Thermal conductivity and pressure coefficients							
	CO4	Magnetic field, electrical conductivity and Hall coefficient							
	CO5	Young's modulus, Rigidity modulus and acceleration due to gravity							

Choice of 10-12 experiments from the following

1. Radius of curvature of a Lens - Newton's rings 2. Thickness of a thin object by air – wedge 3. Spectrometer – resolving power of a prism 4. Spectrometer – resolving power of a transmission grating 5. Spectrometer - hollow prism / ordinary & extraordinary rays by calcite prism* 6. Lorent's Half shade polarimeter – determination of specific rotatory power	**CO1**
7. Determination of wavelength of a laser source using transmission grating, reflection grating (vernier calipers) & particle size determination 8. Determination of numerical aperture & acceptance angle of an optical fiber 9. Determination of optical absorption coefficient of materials using laser* 10. Michelson's interferometer*	**CO2**
11. Coefficient of thermal conductivity - radial flow method 12. Coefficient of thermal conductivity – Lee's disc method 13. Jolly's bulb apparatus experiment – determination of α*	**CO3**
14. Magnetism: I – H curve 15. Field along the axis of a coil carrying current 16. Vibration magnetometer – calculation of magnetic moment & pole strength 17. Electrical conductivity of semiconductor – two probe / four probe method* 18. Hall effect in a semiconductor*	**CO4**
19. Determination of Young's modulus and rigidity modulus 20. Acceleration due to gravity - compound pendulum *Demonstration experiments	**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Reference Books

1. Physics Practical Observation Manual, Department of Physics, Pondicherry Engineering College.

Department : **Chemistry**		Programme : **B.Tech**						
Semester : **First/Second**		Course Category Code: **BSC**				Semester Exam Type: **TY**		
Course Code	Course	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
CY201	**Chemistry**	3	1	-	4	40	60	100
Prerequisite:	-							
Course Outcome	The course will enable the student to:							
	CO1	Analyse microscopic chemistry in terms of orbitals, structure and intermolecular forces						
	CO2	Rationalize the bulk properties and processes						
	CO3	Study the concepts of electrochemistry and its applications						
	CO4	Understand the mechanism of chemical reactions and synthesis of molecules						
	CO5	Comprehension of the concepts of analytical techniques.						

UNIT-I	**Chemical bonding and isomerism**	**Periods: 12**
Chemical bonding-valence bond theory, overlapping of orbitals. Hybridization in carbon compounds-sp, sp^2 and sp^3. Electron pair repulsion. Hybridization and shape of water and ammonia molecules. Molecular orbital theory-combination of atomic orbitals. Bond order. Molecular orbital diagrams for homonuclear diatomic molecules-(hydrogen to neon). Ionic, dipolar and van der Waals interactions. Structural and stereo isomerism-geometrical isomerism in alkenes. Optical isomerism-optical activity, chiral carbon. Optical isomerism in lactic acid and tartaric acid. Enantiomers, diastereomers and meso compounds. Resolution of racemic mixtures, racemization, asymmetric synthesis, Walden inversion.		**CO1**
UNIT-II	**Water chemistry and reaction kinetics**	**Periods: 12**
Water chemistry-hard and soft water, removal of hardness by ion exchange and zeolite processes. Determination of hardness by EDTA method. Desalination-Reverse osmosis. Adsorption-adsorption of gases on solids-Freundlich and Langmuir adsorption isotherms. Factors affecting adsorption of gases on solids. Chemical kinetics-rate of a reaction, factors affecting rate of reaction, first and second order rate equations. Half-life of reactions.		**CO2**
UNIT-III	**Electrode potential and corrosion**	**Periods: 12**
Electrode potential, electromotive force, reference electrodes-hydrogen, Ag/AgCl, calomel and glass electrodes. Nernst equation and applications. Electrolyte concentration cell. Batteries-Primary and secondary batteries. Dry cell, alkaline battery, Ni-Cd battery and lead-acid battery. Fuel cell-Hydrogen-oxygen fuel cell. Corrosion-dry and wet corrosion, mechanism of electrochemical corrosion, galvanic, pitting and concentration cell corrosion. Factors influencing corrosion. Corrosion control by cathodic protection. Anodization.		**CO3**
UNIT-IV	**Introduction to reaction mechanism**	**Periods: 12**
Introduction to reaction mechanism-factors influencing a reaction, homolytic and heterolytic bond fission. Reaction intermediates-carbonium ion, carbanion, free radicals and carbenes. Electrophiles and nucleophiles. Mechanism of free radical substitution-chlorination of methane. Mechanism of electrophlic substitution-bromination of benzene. Nucleophilic substitution-S_N2-hydrolysis of methyl bromide, S_N1-hydrolysis of t-butyl bromide. Elimination reactions-E1 and E2. Addition reactions-nucleophilic and electrophilic. Synthesis of aspirin, paracetamol, sulfanilamide and chloroquine.		**CO4**
UNIT-V	**Analytical techniques**	**Periods: 12**
Absorption and emission of radiation. Beer-Lamberts law. Ultraviolet and visible spectroscopy-basic principles and instrumentation. Basic principles and instrumentation of atomic absorption spectrometry, hollow cathode lamp. Conductivity-equivalent and molar conductance, cell constant. Conductometric titration-types of conductometric titrations. Potentiometry-principle of acid base titration. Chromatography- Principles and instrumentation of gas Chromatograph.		**CO5**

Lecture Periods: 45	**Tutorial Periods: 15**	**Practical Periods: -**	**Total Periods: 60**

Reference Books

1. P.C. Jain and Monika Jain, Engineering Chemistry, Dhanpat Rai Publishing Company, New Delhi, 2016.
2. S.S. Dara and S.S Umare, A Textbook of Engineering Chemistry, S. Chand & Co., Ltd. New Delhi, 2013.
3. Arun Bahl, B.S. Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand and Company Ltd, New Delhi, 2016
4. Arun Bahl and B.S. Bahl, A Text Book of Organic Chemistry, S. Chand and Company Ltd, New Delhi, 2011
5. B.R. Puri, L.R. Sharma and K.C Kalia, Principles of Inorganic Chemistry, Milestone Publishers, New Delhi, 2007
6. G.R. Chatwal and S.K. Anand, Instrumental Methods of Chemical Analysis, Himalaya Publishing House Pvt Ltd, New Delhi, 2005
7. D.A. Skoog, F.J. Holler and T.A. Nieman, Principles of Instrumental Analysis, Thomson Asia Pvt. Ltd, Singapore, 2004.

Department : **Chemistry**		Programme : **B.Tech.**						
Semester : **First/Second**		Course Category Code: **BSC**				Semester Exam Type: **LB**		
Course Code	Course	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
CY202	**Chemistry Laboratory**	-	-	3	1.5	40	60	100
Prerequisite	-							

Course Outcome		
	The students will learn to:	
	CO1	Determine rate constants and order of reactions
	CO2	Measure molecular/system properties such as surface tension, viscosity, partition coefficient, hardness of water, adsorption, saponification value and acid value
	CO3	Analyze quantitatively the contents of samples
	CO4	Use conductivity, potentiometric and chromatographic techniques
	CO5	Analyse a salt sample

Choice of 10-12 experiments from the following:

1. Kinetic study of acid hydrolysis of ethyl acetate	**CO1**
2. Determination of surface tension and viscosity 3. Partition of benzoic acid between benzene and water 4. Total hardness of water - Determination by EDTA method 5. Freundlich adsorption isotherm - Adsorption of acetic acid on charcoal 6. Saponification value and acid value of an oil	**CO2**
7. Chloride content of water - Determination by Mohr's method 8. Determination of oxalic acid by permanganometry 9. Determination of ferrous by permanganometry 10. Determination of ferrous and ferric by dichrometry 11. Determination of carbonate and bicarbonate in a mixture 12. Beer-Lamberts law - Determination of ferrous by colorimetry 13. Magnesium content in water - Determination by EDTA method 14. Acetic acid content in vinegar 15. Dissolved oxygen content in water - Determination by Winkler's method. 16. Determination of available chlorine in bleaching powder.	**CO3**
17. Conductometric titration 18. Potentiometric titration 19. Thin layer chromatography	**CO4**
20. Chemical analysis of salt for cations and anions	**CO5**

Lecture Periods:	**Tutorial Periods: -**	**Practical Periods: 45**	**Total Periods: 45**

Reference Books

1. Lab Manual, Department of Chemistry, Pondicherry Engineering College, Puducherry, 2018.
2. V. Venkateswaran, R. Veeraswamy and A.R. Kulandaivelu, Basic Principles of Practical Chemistry, Sultan Chand & Sons, New Delhi, 2001.
3. J. Mendham, R.C. Denney, J.D. Barnes and M. Thomas, Vogel's Text Book of Quantitative Chemical Analysis, Pearson Education, New Delhi, 2002.

Department : **Humanities and Social Sciences**		Programme : **B.Tech**						
Semester : **First/Second**		Course Category Code: **HSM**			Semester Exam Type: **TY**			
Course Code	Course	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
HS201	**English for Communication**	2	-	2	3	40	60	100
Prerequisite	-							

Course Outcome		
	CO1	To help the learners to develop their technical communication skills
	CO2	To equip the learners with skills required for developing their reading prowess.
	CO3	To enhance the writing skills of learners by providing practice in writing.
	CO4	To instil confidence in learners to develop their speaking skills and enable them to articulate with ease.
	CO5	To facilitate vocabulary enhancement and grammatical correctness in communication.

UNIT-I	**TECHNICAL COMMUNICATION**	**Periods: 12**
Nature of Technical communication – Forms of Technical Communication – General and Technical Communication – Importance and need –Organization in Technical Communication – Style – ABC of Technical Communication –Technical Communication Skills.		**CO1**
UNIT-II	**COMPREHENSION AND ANALYSIS**	**Periods: 12**
Technical and Non-Technical passages – Reading methods – Skimming – Scanning– Extensive and Intensive reading – Inferring – Contextual meaning – summary – note making.		**CO2**
UNIT-III	**PRACTICE IN WRITING**	**Periods: 12**
Sentence Structures – Use of phrases and clauses in sentences – coherence in writing – principles for paragraph writing –Essay Writing – describing – defining – classifying – Business letters – memorandum – instructions – E-mail –reports.		**CO3**
UNIT-IV	**SPEAKING PRACTICE**	**Periods: 12**
Pronunciation –Basics of Phonetics– Conversations and dialogues –formal presentations – Group Discussions – Extempore speaking – Debates- Role Plays– interview skills.		**CO4**
UNIT-V	**GRAMMAR AND VOCABULARY BUILDING**	**Periods: 12**
Word formation – root words from foreign languages and their use in English – Prefixes and suffixes –subject-verb agreement – Articles – voice – preposition– importance of punctuation – Redundancies – synonyms, Antonyms and standard abbreviations– Indianisms.		**CO5**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 60**

Reference Books

1. Sudarshana, N.P and C. Savitha. English for Technical Communication. Noida: CUP, 2016.
2. Shoba, K N and Lourdes Joavani Rayen. Communicative English. Chennai: CUP, 2017.
3. Rizvi, Ashraf, M. Effective Technical Communication. New Delhi: McGraw, 2017.
4. Daniel Jones. English Pronouncing Dictionary. Cambridge University Press, 2003.
5. Dutt, Kiranmai P and Geetha Rajeevan. Basic Communication Skills. New Delhi: CUP,2013
6. Sanjay Kumar and Pushpalata. Communication Skills. New Delhi: OUP, 2011.
7. Mohan, Krishna and Meera Banerji. Developing Communication Skills. 2nd edition. Delhi: Macmillan, 2012.
8. Relevant material from newspapers, magazines and journals will be used for integrated practice.

Department : **Mechanical Engineering**			Programme : **B.Tech**						
Semester : **First/Second**			Course Category Code: **ESC**				Semester Exam Type: **LB**		
Course Code	Course		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	SE	TM
ME201	**Workshop and Manufacturing Practice**		0	0	3	1.5	40	60	100
Prerequisite									
Course Outcome	**CO1**	To convey the basics of mechanical tools used in carpentry section and establish hands on experience in making the different carpentry joints							
	CO2	To gain knowledge on types of tools and machines used in sheet metal shop and perform some exercises							
	CO3	To develop basic welding and fitting joints using the hand tools and establish the importance of joints and fitting in engineering applications							
	CO4	To gain knowledge of the different machines used in manufacturing processes which are commonly employed in the industry, to fabricate components using different materials							
	CO5	To carry out simple manufacturing operations in lathe, drilling and shaping machine							
UNIT-I	**Carpentry**					**Periods: 9**			
Study of tools and machines in carpentry Practice on :1.Half Lap joint 2.Corner Mortise joint and 3.Dovetail joint									**CO1**
UNIT-II	**Sheet Metal**					**Periods: 9**			
Study of tools and machineries in sheet metal shop 1.Frustum of cone 2.Waste collection tray and 3.Rectangular box									**CO2**
UNIT-III	**Welding and Fitting**					**Periods: 9**			
Lectures/demonstrations/videos on Welding and fitting operations with simple exercise. 1. Filing and Job preparation 2. V-Fitting and 3. Simple lap joint									**CO3**
UNIT-IV	**Study of tools and machines**					**Periods: 6**			
Study of tools and machines in manufacturing lab 1. Lathe machine 2.Drilling machine and 3.Shaping machine									**CO4**
UNIT-V	**Simple Exercises in Lathe/Drilling machine/Shaper**					**Periods: 12**			
Simple operations in lathe, drilling and shaping 1.Facing and Turning 2.Step Turning 3.Drilling in a flat plate with different drill dimensions and 4.Cube in Shaping									**CO5**
Lecture Periods: 3	**Tutorial Periods: -**		**Practical Periods: 42**			**Total Periods: 45**			

Reference Books

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. H.N.Gupta, R.C.Gupta and Arun Mittal, Manufacturing Processes, New Age Publications, 2001.

Department : **Mechanical Engineering**			Programme : **B.Tech**						
Semester : **First/Second**			Course Category Code: **ESC**			Semester Exam Type: **TY**			
Course Code	Course		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	SE	TM
ME202	**Engineering Graphics and Computer Aided Drawing**		2	-	4	3	40	60	100
Prerequisite	-								
Course Outcome	**CO1**	Students learn to properly dimension and annotate engineering drawings as per standards of engineering drawing practice.							
	CO2	Students are made to follow and understand the basics of engineering drawing with simple solids.							
	CO3	Students can properly apply and produce sectional views.							
	CO4	Students are able to properly create multi-view orthographic drawings from three dimensional diagrams. Students are able to present a drawing in orthographic and isometric projections.							
	CO5	Students learn the application of engineering graphics through computer-aided drafting.							
UNIT-I						**Periods: 18**			
Introduction to Engineering graphics, Standards for Engineering Drawing practice, Lettering, Line work and Dimensioning, Projection of Lines, Projection of Planes									**CO1**
UNIT-II						**Periods: 18**			
Projections of simple solids									**CO2**
UNIT-III						**Periods: 18**			
Sections of solids and Development of surfaces									**CO3**
UNIT-IV						**Periods: 18**			
Isometric Projections and Orthographic Projections									**CO4**
UNIT-V						**Periods: 18**			
Introduction to Computer Graphics and Drafting, Auto CAD, 2-D diagrams of simple geometries using Auto-CAD script.									**CO5**
Lecture Periods: 30	**Tutorial Periods: -**		**Practical Periods: 60**			**Total Periods: 90**			

Reference Books

1. K.R. Gopalakrishna and Sudhir Gopalakrishna, Engineering Graphics, Inzinc Publishers, 2007.
2. K.Venugopal, Engineering Drawing & Graphics + Auto CAD, 4th edition, New Age Int'lPublication Ltd., 2004.
3. BIS, Engineering Drawing practices for Schools & College, SP 46: 2003.
4. T. Jeyapoovan, Engineering Graphics using AUTOCAD, 7th edition, VIKAS Publishing House (P) Ltd., 2015.
5. N.D. Bhatt, Engineering Drawing, 49th edition, Charotar Publishing House, 2014.
6. K.V. Natarajan, A Text Book of Engineering Drawing, Dhanalakshmi Publishers, 2006.
7. M. B. Shah and B. C. Rana, Engineering Drawing, 2nd edition, Pearson Publications, 2018.
8. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
9. http://www.3ds.com/products/catia/
10. http://en.wikipedia.org/wiki/CATIA

Department : **Electrical and Electronics Engineering**		Programme : **B.Tech**						
Semester : **First/Second**		Course Category Code: **ESC**				Semester Exam Type: **TY**		
Course Code	Course	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
EE201	**Basic Electrical Engineering**	3	1	-	4	40	60	100
Prerequisite	-							
Course Outcome	**CO1**	To understand the basic concepts of DC circuits and theorems.						
	CO2	To explain the concepts of AC circuits and resonance.						
	CO3	To understand the basic concepts of magnetic circuits and transformer.						
	CO4	To explain the working principle, construction, applications of electrical machines.						
	CO5	To Gain knowledge of working of power plants and fundamentals of switch gear and earthing.						

UNIT-I	**DC Circuits**	**Periods: 12**	
Electrical circuit elements (R, L and C) - Definition of Voltage, Current, Power and Energy – Ohm's law, Kirchoff current and voltage laws, analysis of simple circuits with DC voltage – Division of current in series and parallel circuits – Star-delta conversion – Node and mesh method of analysis of DC circuits – Network Theorems: Thevenin, Norton and Superposition Theorems.			**CO1**
UNIT-II	**AC Circuits**	**Periods: 12**	
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel). Resonance: Series and parallel resonance. Three-phase balanced circuits: voltage and current relations in star and delta connections – Power measurement by two Wattmeter method.			**CO2**
UNIT-III	**Transformers**	**Periods: 12**	
Laws of Electromagnetic induction – Ampere's circuital law, Faraday's law and Lenz law – Dot rule. Magnetic materials, B-H characteristics. Single phase transformer: Construction and working, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.			**CO3**
UNIT-IV	**Electrical Machines**	**Periods: 12**	
Elementary concept of rotating machines – Flemming's right hand and left hand rule – DC Machines: Construction and working of DC Machines - Generator and Motors – Emf equation of DC generator and back emf of DC motor –characteristics - Types of DC Machines. AC Machines: Construction and working of Single phase & three phase induction motors and synchronous generator (qualitative approach only).			**CO4**
UNIT-V	**Power Plants and LT Switch gear**	**Periods: 12**	
Power Plants: Layout of thermal, hydro and nuclear power generation (block diagram approach only). Components of AC transmission and distribution systems – One-line diagram. Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables. Earthing. Elementary calculations for energy consumption.			**CO5**

Lecture Periods: 45	**Tutorial Periods: 15**	**Practical Periods: -**	**Total Periods: 60**

Reference Books

1. D. P. Kothari and L. J. Nagrath, "Basic Electrical Engineering", 3rd Edition, Tata McGraw Hill, 2017.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", Tata McGraw Hill, 2011.
3. Rajendra Prasad, "Fundamentals of Electrical Engineering", 3rd Edition, PHI Learning Private Limited, 2014.
4. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
5. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
6. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

Department : **Electrical and Electronics Engineering**			Programme : **B.Tech**						
Semester : **First/Second**			Course Category Code: **ESC**			Semester Exam Type: **LB**			
Course Code	Course		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	SE	TM
EE202	**Basic Electrical Engineering Laboratory**		-	-	3	1.5	40	60	100
Prerequisite	-								
Course Outcome	**CO1**	To understand the principles of domestic wiring and electrical components.							
	CO2	To illustrate handling of measuring instruments and demonstrate the concepts of network theorems							
	CO3	To analyze RL,RC,RLC circuits							
	CO4	To introduce concepts of single/three phase circuits							
	CO5	To demonstrate the working principle of electrical machines							

Any 10 experiments

1. Study of: Basic safety precautions. Concepts of domestic wiring- wires, switches, plugs, sockets, fuses and lamp holders. 2. Study of fan and tube light connections and earthing 3. Stair case wiring. 4. Bedroom wiring.	**CO1**
5. Use of measuring instruments. Verification of Kirchoff's voltage and current law 6. Verification of Thevenin and Norton theorems 7. Verification of Superposition Theorem.	**CO2**
8. Impedance calculation of R-L, R-C & R-L-C circuits and verification. 9. Measurement of power & power factor in a single phase AC circuit using three Ammeter Method 10. Resonance: Series and parallel.	**CO3**
11. Measurement of various line and phase quantities for a three phase star/delta ac circuit. 12. Measurement of three phase power using two wattmeter method. 13. Energy measurement using single phase energy meter.	**CO4**
14. Load test on a single phase transformer. 15. Load test on a single phase induction motor.	**CO5**

Lecture Periods:	**Tutorial Periods:**	**Practical Periods: 45**	**Total Periods: 45**

Reference Books

1. Laboratory Manual, Department of Electrical and Electronics Engineering, Pondicherry Engineering College.

Department : **Computer Science and Engineering**		Programme : **B.Tech**						
Semester : **First/Second**		Course Category Code: **ESC**			Semester Exam Type: **TY**			
Course Code	Course	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
CS201	**Programming for Problem Solving**	3	-	-	3	40	60	100
Prerequisite	-							

Course Outcome		
	CO1	Understood the phases of problem solving techniques for simple problems.
	CO2	Able to write programs using the basic language constructs.
	CO3	Able to build a larger programs using function oriented approaches.
	CO4	Could write efficient programs using advanced concepts to optimize the memory.
	CO5	Could write programs to access data from the secondary storage efficiently.

UNIT-I	**Algorithmic Problem Solving**	**Periods: 9**
History and Classifications of Computers – Components of Computer – Working Principle of Computer – Hardware – Software and its Types – Applications of Computers. Generations of Programming Languages – Introduction to Number System. Problem solving techniques: Program development life-cycle – Algorithms – building blocks of algorithms - Algorithmic problem solving-Flowchart– Pseudo code.		**CO1**
UNIT-II	**Data, Expressions, Statements**	**Periods: 9**
Introduction to C –C Program Structure – C Tokens: Keyword, Identifiers, Constants, Variables and Data types (simple and user-defined) – Operators and its types – Operator Precedence – Expression Evaluation – Type Conversion –Managing Input/output operations-Branching Statements – Looping Statements.		**CO2**
UNIT-III	**Arrays and Functions**	**Periods: 9**
Arrays – Two dimensional arrays, Multidimensional arrays. Character arrays. Functions: Function Prototype, Passing Arguments to Function – Call by Value and Call by Reference – Nested function call – Library Functions – User-defined Functions – Recursion. Strings – String I/O functions, String Library functions – Storage classes.		**CO3**
UNIT-IV	**Structures, Unions and Pointers**	**Periods: 9**
Structures – Arrays and structures – Nested structures – Structure as argument to functions–Union. Pointers – Declaration, Initialization and Accessing Pointer variable – Pointers and arrays – pointers as argument and return value – Pointers and strings - Pointers and structures.		**CO4**
UNIT-V	**File Management**	**Periods: 9**
Introduction to File Concepts in C – File types – I/O operations on files – File modes – Random access to files – Command line arguments. Dynamic Memory Allocation: MALLOC, CALLOC, FREE, REALLOC. Introduction to preprocessor: Macro substitution directives – File inclusion directives –Compiler Control directives – Miscellaneous directives.		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Reference Books

1. Balagurusamy. E, “Programming in ANSI C”, Tata McGraw Hill, Seventh Edition, 2017.
2. Byron Gottfried & Jitender Chhabra, “Programming with C”, Schaum's Outlines Series, 2017.
3. Brian W. Kernighan & Dennis Ritchie. “The C Programming Language”, Pearson Education India; Second Edition, 2015.
4. Ashok N Kamthane, “Computer Programming”, Pearson education, Second Edition, 2012.

Department : **Computer Science and Engineering**		Programme : **B.Tech**						
Semester : **First/Second**		Course Category Code: **ESC**				Semester Exam Type: **LB**		
Course Code	Course	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	SE	TM
CS202	**Programming Laboratory**	-	-	3	1.5	40	60	100
Prerequisite	-							

Course Outcome	**CO1**	Understood the program editing and compilation environment.
	CO2	Able to write simple C programs using most frequently used control structures.
	CO3	Apply the methods problems using arrays and functions.
	CO4	Learnt to handle data processing using structures for simple applications.
	CO5	Write programs that could handle file i/o and pointers.

Programming Using C

1. Study of Compilation and execution of simple C programs 2. Basic C Programs a. Arithmetic Operations b. Area and Circumference of a circle c. Swapping with and without Temporary Variables	**CO1**
3. Programs using Branching statements a. To check the number as Odd or Even b. Greatest of Three Numbers c. Counting Vowels d. Grading based on Student's Mark 4. Programs using Control Structures a. Computing Factorial of a number b. Fibonacci Series generation c. Prime Number Checking d. Computing Sum of Digit	**CO2**
5. Programs using Arrays a. Sum of 'n' numbers b. Sorting an Array c. Matrix Addition, Subtraction, Multiplication and Transpose 6. Programs using Functions a. Computing nCr b. Factorial using Recursion c. Call by Value and Call by Reference	**CO3**
7. Programs using String Operations a. Palindrome Checking b. Searching and Sorting Names 8. Programs using Structure a. Student Information System b. Employee Pay Slip Generation c. Electricity Bill Generation	**CO4**
9. Programs using Pointers a. Pointer and Array b. Pointers as argument and return value c. Pointer and Structure 10. Programs using File Operation a. Counting No. of Lines, Characters and Black Spaces b. Content copy from one file to another c. Reading and Writing Data in File	**CO5**

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 45**	**Total Periods: 45**

Reference Books

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Department : **Civil Engineering**			Programme : **B.Tech**						
Semester : **First/Second**			Course Category Code: **MCC**			Semester Exam Type: -			
Course Code	Course		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	SE	TM
CE201	**Environmental Science**		3	-	-	Non-Credit	-	-	-
Prerequisite	-								
Course Outcome	**CO1**	Able to understand about the environment and natural resources available							
	CO2	Able to design the Rainwater harvesting and adopting the methods for recycle and reuse of domestic water							
	CO3	Able to address the environmental issues namely pollution, depletion of natural resources and degrading ecosystem							
	CO4	Able to develop models for resource and energy management, which are environmental friendly and work for sustainable development of the humanity.							
	CO5	Able to participate in the Green initiatives in the society i.e. Energy conservation and Tree plantation.							
	CO6	Able to make the solid waste segregation and conduct events related environmental issues.							

Activity – 1		**Periods: 9**	
Water resources- Water Cycle, Distribution, Groundwater flow, Demand for water, Water pollution- causes and effects, Water Act (1974).			**CO1**
Activity – 2		**Periods: 9**	**CO2**
Rainwater Harvesting-Methodology, components, design of rainwater harvesting system for a single house (as per IS:15797-2008)			
Activity – 3		**Periods: 9**	
Domestic waste water- Definition, Characteristics, Recycling and Reuse of domestic waste water.			
Activity – 4		**Periods: 9**	**CO3**
Air Pollution- definition, classification, causes, Sources, effects and control measures, Air Act (1981)			
Activity – 5		**Periods: 9**	
Solid Waste management – Causes- effects and control measures of Urban and industrial waste, Waste management initiatives in India for human well-being.			
Activity – 6		**Periods: 9**	**CO4**
Renewable and non-renewable energy resources- use of alternating energy sources – Energy management.			
Activity – 7		**Periods: 9**	**CO5**
Green Buildings- Definition, Importance, building envelope, Problems in existing buildings, Energy use in Buildings, Greenhouse gas emissions and indoor air pollution, green construction materials, Green building assessment system, Case study			
Activity – 8		**Periods: 9**	
Importance of Tree Plantation, Display of usefulness of trees, Method of tree planting, Identify the trees available in the PEC campus, Mass Plantation inside/outside the campus in association with the H2EC /NSS of PEC, Store the trees to the planted by the dignitaries with the help of horticulture of PEC.			
Activity – 9		**Periods: 9**	**CO6**
Collection and segregation of solid waste in the PEC campus in association with the H2EC /NSS of PEC			
Activity – 10		**Periods: 9**	
Invite guest Lectures from the Environmental experts of DSTE (for environmental issues)/REAP (for energy efficient buildings)/Town and Country Planning/PWD of Puducherry, conducting competitions to students in the topics of slogan making, poster and seminar presentations, debate and observing the important national and international days on environmental issues to bring awareness among the students and public.			

Activity Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Reference Books

1. P.Yugananth, R.Kumaravelan, Environmental Science and Engineering, Scitech Publications (Inida) P.Ltd., Delhi, 2017.
2. John Pichtel, Waste Management Practices: Municipal, Hazardous and Industrial, CRC Press,2014
3. V.S.K.V.Harish, Arunkumar, Green Building Energy Simulation and Modeling, Elsevier Science & Technology,2018
4. Anubha Kaushik and C.P.Kaushik, Environmental Science and Engineering, New Age International (P) Ltd., New Delhi, 2010.
5. S.S.Dara, A text book of Environmental Chemistry and Pollution Control, S.Chand and Company Ltd., New Delhi, 2014.
6. IS:15797:2008, Roof Top Rainwater Harvesting-Guidelines, BIS, New Delhi
7. Energy Conservation Building Code, 2017, Bureau of Energy Efficiency, Ministry of Power, Government of India.