ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
B.E. COMPUTER SCIENCE AND ENGINEERING
RUSA
REGULATIONS – 2018
I - VIII SEMESTERS CURRICULA AND I&II SYLLABI

SEMESTER I

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
THEORY									
1.	HS6151	Technical English I	HS	4	4	0	0	3	5
2.	PH6151	Engineering Physics	BS	5	3	0	2	3	5
3.	MA6151	Mathematics I	BS	4	3	1	0	3	5
4.	CS6101	Programming with C	HC	7	2	1	4	3	6
5.	CS6102	Computational Thinking	HC	4	0	0	4	3	3
			TOTAL	**24**	**12**	**2**	**10**	**15**	**24**

SEMESTER II

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
THEORY									
1.	HS6251	Technical English II	HS	4	4	0	0	3	5
2.	CY6251	Engineering Chemistry	BS	5	3	0	2	3	5
3.	MA6251	Discrete Mathematics	BS	4	3	1	0	3	5
4.	GE6251	Engineering Graphics	ES	6	2	0	4	3	5
5.	CS6103	Application Development Practices	HC	5	1	0	4	3	4
			TOTAL	**24**	**13**	**1**	**10**	**15**	**24**

SEMESTER III

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
THEORY									
1.	CS6104	Data Structures and Algorithms	HC	8	3	1	4	3	7
2.	CS6105	Digital Fundamentals and Computer Organization	HC	8	3	1	4	3	7
3.	MA6351	Probability and Statistics	BS	4	3	1	0	3	5
4.	EE6351	Basics of Electrical and Electronics Engineering	ES	8	4	0	4	3	7
5.		Open Elective I	OE	3	3	0	0	3	4
			TOTAL	**31**	**16**	**3**	**12**	**15**	**30**

SEMESTER IV

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
THEORY									
1.	CS6106	Database Management Systems	HC	7	3	0	4	3	6
2.	CS6107	Computer Architecture	HC	5	3	0	2	3	5
3.	CS6108	Operating Systems	HC	7	3	0	4	3	6
4.		Mathematics Soft Core I	MSC	4/7	3	1/0	0/4	3	5/6
5.		Open Elective II	OE	3	3	0	0	3	4
			TOTAL	**26/29**	**15**	**1**	**10/ 14**	**15**	**26/27**

SEMESTER V

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
THEORY									
1.	CS6109	Compiler Design	HC	7	3	0	4	3	6
2.	CS6110	Object Oriented Analysis and Design	HC	7	3	0	4	3	6
3.	CS6111	Computer Networks	HC	7	3	0	4	3	6
4.		Mathematics Soft Core II	MSC	4/7	3	1/0	0/4	3	5/6
5.		Professional Soft Core I	PSC	3/7	3	0	0/4	3	4/6
			TOTAL	**28/35**	**15**	**1**	**12/20**	**15**	**27/30**

SEMESTER VI

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
THEORY									
1.		Professional Soft Core II	PSC	3/7	3	0	0/4	3	4/6
2.		Professional Soft Core III	PSC	3/7	3	0	0/4	3	4/6
3.		Professional Soft Core IV	PSC	3/7	3	0	0/4	3	4/6
4.		Professional Elective I	PE	3	3	0	0	3	4
5.	CS6611	Creative and Innovative Project	EEC	4	0	0	4	3	3
			TOTAL	**16/28**	**12**	**0**	**16**	**15**	**19/25**

SEMESTER VII

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
THEORY									
1.		Professional Elective II	PE	3	3	0	0	3	4
2.		Professional Elective III	PE	3	3	0	0	3	4
3.		Professional Elective IV	PE	3	3	0	0	3	4
4.		Professional Elective V	PE	3	3	0	0	3	4
			TOTAL	**12**	**12**	**0**	**0**	**12**	**16**

SEMESTER VIII

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
THEORY									
1.		Professional Elective VI	PE	3	3	0	0	3	4
2.		Professional Elective VII	PE	3	3	0	0	3	4
3.	CS6811	Project Work	EEC	12	0	0	12	9	9
			TOTAL	**18**	**6**	**0**	**12**	**15**	**17**

MINIMUM NO OF CREDITS TO BE ACQUIRED:190

HUMANITIES AND SOCIAL SCIENCES (HS)

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
THEORY									
1.	HS6151	Technical English I	HS	4	4	0	0	3	5
2.	HS6251	Technical English II	HS	4	4	0	0	3	5

BASICS SCIENCES (BS)

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
THEORY									
1.	PH6151	Engineering Physics	BS	5	3	0	2	3	5
2.	MA6151	Mathematics I	BS	4	3	1	0	3	5
3.	MA6251	Discrete Mathematics	BS	4	3	1	0	3	5
4.	CY6251	Engineering Chemistry	BS	5	3	0	2	3	5
5.	MA6351	Probability and Statistics	BS	4	3	1	0	3	5

ENGINEERING SCIENCES (ES)

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
THEORY									
1.	GE6251	Engineering Graphics	ES	6	2	0	4	3	5
2.	EE6351	Basics of Electrical and Electronics Engineering	ES	8	4	0	4	3	7

HARD CORE (HC)

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
THEORY									
1.	CS6101	Programming with C	HC	7	2	1	4	3	6
2.	CS6102	Computational Thinking	HC	4	0	0	4	3	3
3.	CS6105	Digital Fundamentals and Computer Organization	HC	8	3	1	4	3	7
4.	CS6104	Data Structures and Algorithms	HC	8	3	1	4	3	7
5.	CS6110	Object Oriented Analysis and Design	HC	7	3	0	4	3	6
6.	CS6109	Compiler Design	HC	7	3	0	4	3	6
7.	CS6108	Operating Systems	HC	7	3	0	4	3	6
8.	CS6106	Data Base Management Systems	HC	7	3	0	4	3	6
9.	CS6111	Computer Networks	HC	7	3	0	4	3	6
10.	CS6107	Computer Architecture	HC	5	3	0	2	3	5
11.	CS6103	Application Development Practices	HC	5	1	0	4	3	4

MATHEMATICS SOFTCORE (MSC)

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
THEORY									
1.	MA6201	Linear Algebra	MSC	4	3	1	0	3	5
2.	CS6201	Graph Theory	MSC	4	3	1	0	3	5
3.	EC6201	Signals and Systems	MSC	7	3	0	4	3	6
4.	CS6202	Theory of Computation	MSC	4	3	1	0	3	5

PROFESSIONAL SOFTCORES (PSC)

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
THEORY									
1.	CS6301	Machine Learning	PSC	7	3	0	4	3	6
2.	CS6302	Programming Paradigms	PSC	3	3	0	0	3	4
3.	CS6303	Distributed Systems	PSC	3	3	0	0	3	4
4.	CS6304	Software Engineering	PSC	3	3	0	0	3	4
5.	CS6305	Microprocessors	PSC	7	3	0	4	3	6
6.	CS6306	Parallel Programming	PSC	7	3	0	4	3	6
7.	CS6307	Advanced Algorithms	PSC	7	3	0	4	3	6
8.	CS6308	Java/Internet Programming	PSC	7	3	0	4	3	6

PROFESSIONAL ELECTIVES (PE)
TRACK - 1

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
THEORY									
1.	CS6001	Data Mining	PE	3	3	0	0	3	4
2.	CS6002	Soft Computing	PE	3	3	0	0	3	4
3.	CS6003	Big Data Analytics	PE	3	3	0	0	3	4
4.	CS6004	Information Visualization	PE	3	3	0	0	3	4
5.	CS6005	Deep Learning Techniques	PE	3	3	0	0	3	4

PROFESSIONAL ELECTIVES (PE)
TRACK - 2

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
THEORY									
1.	CS6006	Cloud Computing	PE	3	3	0	0	3	4
2.	CS6007	Information Security	PE	3	3	0	0	3	4
3.	CS6008	Cryptography and Network Security	PE	3	3	0	0	3	4
4.	CS6009	Mobile Networks	PE	3	3	0	0	3	4
5.	CS6010	Wireless and Sensor Networks	PE	3	3	0	0	3	4

PROFESSIONAL ELECTIVES (PE)
TRACK - 3

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
THEORY									
1.	CS6011	GPU Computing	PE	3	3	0	0	3	4
2.	CS6012	Embedded Systems	PE	3	3	0	0	3	4
3.	CS6013	Unix Internals	PE	3	3	0	0	3	4
4.	CS6014	IoT and Smart Appliances	PE	3	3	0	0	3	4
5.	CS6015	Multicore Architectures	PE	3	3	0	0	3	4

PROFESSIONAL ELECTIVES (PE)
TRACK - 4

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
THEORY									
1.	CS6016	Graphics and Multimedia	PE	3	3	0	0	3	4
2.	CS6017	Human Computer Interaction	PE	3	3	0	0	3	4
3.	CS6018	Image Processing	PE	3	3	0	0	3	4
4.	CS6019	Augmented Reality and Virtual Reality	PE	3	3	0	0	3	4
5.	CS6020	Digital Signal Processing	PE	3	3	0	0	3	4

PROFESSIONAL ELECTIVES (PE)
TRACK - 5

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
1.	CS6021	Software Testing & Quality Assurance	PE	3	3	0	0	3	4
2.	CS6022	Software Project Management	PE	3	3	0	0	3	4
3.	CS6023	Software Test Automation	PE	3	3	0	0	3	4
4.	CS6024	Test Driven Development	PE	3	3	0	0	3	4
5.	CS6025	Software Process Models	PE	3	3	0	0	3	4

PROFESSIONAL ELECTIVES (PE)
TRACK - 6

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
1.	CS6026	Game Theory	PE	3	3	0	0	3	4
2.	CS6027	Modeling and Simulation	PE	3	3	0	0	3	4
3.	CS6028	Queuing Theory and Performance Evaluation of Computer Systems	PE	3	3	0	0	3	4
4.	CS6029	Social Network Analysis	PE	3	3	0	0	3	4
5.	CS6030	Natural Language Processing	PE	3	3	0	0	3	4

PROFESSIONAL ELECTIVES (PE)
TRACK – 7

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
1.	CS6031	Database Tuning	PE	3	2	0	0	3	3
2.	CS6032	Software Defined Networks	PE	3	2	0	0	3	3
3.	CS6033	Storage Area Networks	PE	3	2	0	0	3	3
4.	CS6034	Service Oriented Architecture	PE	3	2	0	0	3	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	CREDITS
THEORY									
1.	CS6611	Creative and Innovative Project	EEC	4	0	0	4	3	3
2.	CS6811	Project Work	EEC	12	0	0	12	9	9

SUMMARY

Category of Courses	HS	BS	ES	OE	HC	MSC	PSC	PE	EEC	Total
Minimum Credits to be earned	10	25	12	8	62	10	20	31	12	190

HS6151 **TECHNICAL ENGLISH I** **L T P EL C**
4 0 0 3 5

MODULE	RHETORICAL FUNCTIONS	PRIMARY FOCUS RHETORICAL FUNCTION: INTRODUCING SELF, THE LINGUISTIC ACT OF NARRATING	PRIMARY OUTCOME
MODULE 1	**SELF-INTRODUCTION. THE LINGUISTIC ACT OF NARRATING**	**Oral Fluency**: Introducing oneself-introducing friend/family (connecting campus)- **Reading**: biographies (subject based) reading strategies-skimming-scanning-predicting- **Language Focus**- Use of present and past tense forms of verbs-(Degrees of Comparison) - **Lexical Development**: Adjectives-learning topic related vocabulary (approximately 30)- **Writing**: short biographies with the given details of (related to specific branches of engineering) **Listening:** listening to speeches by specialists from various branches of engineering and completing activities such as answering questions , identifying the main ideas of the listening text, style of the speaker (tone and tenor) and making inferences.	At the end of the module, students should be able to: ▪ Introduce oneself for at least 2 minutes with minimal intrusive errors and breaks. ▪ Write a paragraph by listing information chronologically
		SUGGESTED ACTIVITIES	**SUGGESTED EVALUATION METHODS**
		• Lectures on the Communicative aspects of language use. • Practical-Listening, Speaking and Writing	• Quizzes • Assignments • Small Group Work

			12 0 0 9
MODULE 2	**COMPARING AND CONTRASTING**	**Oral Fluency**: Comparing and Contrasting (e.g. Facebook and Whatsapp)- **Language Focus:** verbal phrases-compound nouns(noun strings)-simple present and present perfect , future tense-**Lexical Development**: Discourse Analysis-lexical links- related to the function of comparing and contrasting-lexical items related to the reading texts -**Reading:** texts on comparing and contrasting concepts in engineering and technology (e.g. Computers and Artificial intelligence) **Listening**: gap-filling exercises -**Writing:** Definitions(short and long)-paragraph writing especially comparing and contrasting discourse	At the end of the module, students should be able to: ▪ Compare and contrast products/ concepts both in speech and writing
		SUGGESTED ACTIVITIES	**SUGGESTED EVALUATION METHODS**
		• Lectures on the Communicative aspects of language use. • Practical-Listening, Speaking and Writing	• Quizzes • Assignments • Small Group Work
			12 0 0 9

MODULE 3	**STATING PROBLEMS AND EXPRESSING SOLUTIONS**	**Oral Fluency:** Small Group Discussion (e.g. The changing face of the software Industry)-**Language Focus**-sentence level linguistics (construction of function-based sentences)-past continuous and present perfect continuous and future tenses-**Lexical Development**-learning vocabulary related to content and function (approximately 30)-**Reading**: passages discussing problems and solutions (e.g. automation in the software industry and employment opportunities in the next decade)-**Listening**: TED talks & discussions-**Writing:** lengthy paragraphs-(e.g. What does the future hold for the software industry?)-Formal letter writing-highlighting problems and offering solutions.	At the end of the module, students should be able to: • Participate in small group discussions effectively. • Write extended paragraphs • Listen and comprehend long talks
		SUGGESTED ACTIVITIES	**SUGGESTED EVALUATION METHODS**
		• Lectures on the Communicative aspects of language use. • Practical-Listening, Speaking and Writing	• Quizzes • Assignments • Small Group Work
			12 0 0 9
MODULE 4	**EXPRESSING CAUSAL RELATIONS**	**Oral Fluency**- speaking skills practice in small groups. (e.g. uses and abuses of the mobile phone) **Language Focus:** use of passive voice forms of verbs – past participle forms (sentence construction for expressing causal relations)-**Lexical Development**: specialized vocabulary to establish causal relations-**Reading**: texts on cause and effect functions- texts on process description-**Listening**: filling a table, introduction to graphic presentations (pie charts, tables, pictograms) -**Writing:** data interpretation and making inferences	At the end of the module students should be able to: • Write two paragraphs describing and interpreting visual data (charts, tables etc.) • Read and comprehend texts expressing causal relations

		Suggested Activities	**Suggested Evaluation Methods**
		• Lectures on the Communicative aspects of language use. • Practical-Listening, Speaking and Writing	• Quizzes • Assignments • Small Group Work
			12 0 0 9
MODULE 5	**EXTENDED SPEECH**	**Oral Fluency**: making mini presentations (e.g. the working of an algorithm)- **Language Focus**-passive voice and use of phrases - **Lexical Development**: specialist vocabulary related to theme-cohesive ties related to process description (sequential expressions)- **Reading**- Pie chart/Table /Bar chart interpretation -**Listening** – drawing a flowchart – **Writing**: channel conversion– diagram to written forms	At the end of the module, students should be able to : • Make short presentations • Read and interpret visual data • Write a process description
		SUGGESTED ACTIVITIES	**SUGGESTED EVALUATION METHODS**
		• Lectures on the Communicative aspects of language use. • Practical-Listening, Speaking and Writing	• Quizzes • Assignments • Small Group Work

EVALUATION METHOD TO BE USED:

Sl. no	Category of Courses	Continuous Assessment	Mid –Semester Assessment	End Semester
1.	**Theory**	**40**	**20**	**40**

PH6151 ENGINEERING PHYSICS	L	T	P	EL	CREDITS
	3	0	2	3	5

Prerequisites for the course: None

OBJECTIVES:

- To introduce the basic concepts of physics.
- To develop critical thinking through problem solving related to physics
- To identify, analyze and implement possible applications with the goal of achieving the most efficient and effective usage of conceptual physics.

MODULE I :	L	T	P	EL
	3	0	2	3

Elasticity – Stress-strain diagram – cantilever – bending moment – Young's modulus determination – twisting couple.

SUGGESTED ACTIVITIES :

- In Class activity: Simple harmonic motion
- Practical - Nonuniform bending: Determination of Young's modulus.
- EL: Cantilever, Torsional pendulum, Simple harmonic oscillations

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE II :	L	T	P	EL
	3	0	2	3

Torsional pendulum - rigidity modulus - moment of inertia - simple harmonic motion - Wave equation – waves on a string – wave power & intensity – sound waves – decibels.

SUGGESTED ACTIVITIES :

- Flipped classroom and activity
- In class activity: Derivation and Simplification
- EL – Practical Problems - Waves – Resonance – Doppler effect of sound – standing waves in a string
- **Practical – Torsional Pendulum: Determination of rigidity modulus of wire and moment of inertia of disc.**

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE III :	L	T	P	EL
	3	0	2	3

Noise in physical systems – noise mechanisms – ultrasonics: production – magnetostriction and piezoelectric methods – detection of ultrasonic waves– acoustic grating – ultrasonic interferometer.

SUGGESTED ACTIVITIES :

- EL: Piezoelectric effect, acoustic grating
- In class activity: Ultrasonic oscillator construction
- Practical - Ultrasonic interferometer: Determination of velocity of sound and compressibility of liquids.

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE IV :	L	T	P	EL
	3	0	2	3

Thermal expansion – thermal stress – bimetals – heat transfer in solids & thermal conductivity - compound media – Forbe's and Lee's disc method: theory and experiment.

SUGGESTED ACTIVITIES :

- Flipped Class room
- EL: Thermal expansion, bimetals, Compound media, Thermal conductivity
- Practical – Lee's disc: Determination of thermal conductivity of a bad conductor.

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE V :	L	T	P	EL
	3	0	2	3

Double and multiple slits interference – diffraction gratings – thin films – antireflection coating – Newton's rings, air-wedge and their applications – Michelson interferometer – The diffraction limit.

SUGGESTED ACTIVITIES :

- Applications in class discussion
- EL – Thin films, antireflection coating, Air-wedge, Interferometry
- Practical – Air-wedge: Determination of thickness of thin sheet/wire.

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE VI:	L	T	P	EL
	3	0	2	3
Lasers – Principles and applications – Einstein's coefficients – laser resonator - semiconductor laser				
SUGGESTED ACTIVITIES : • Introduction in class • EL: Laser theory, principles, industrial applications, fiber optics • Flipped Classroom for further study • Practical – Compact disc: Determination of width of groove using laser				
SUGGESTED EVALUATION METHODS: • Tutorial problems • Assignment problems • Quizzes				

MODULE VII:	L	T	P	EL
	3	0	2	3
Optical fibers – propagation of light in optical fibers – acceptance angle – numerical aperture – fiber optical communication system – fiber optic sensors.				
SUGGESTED ACTIVITIES : • Combinations of in Class & Flipped class rooms • Practical: Optical fiber: Determination of numerical aperture and acceptance angle. • EL: Fiber optics & sensors				
SUGGESTED EVALUATION METHODS: • Tutorial problems • Assignment problems • Quizzes				

MODULE VIII:	L	T	P	EL
	3	0	0	3
Wave - particle duality - The Schrodinger equation - time dependent and independent equations - expectation values - particle in a box.				
SUGGESTED ACTIVITIES : • Illustration of potential wells and tunneling phenomena in class • Flipped classroom • EL – Wave - particle duality, Schrodinger equation, Particle in a box problem (1D, 2D, 3D)				
SUGGESTED EVALUATION METHODS: • Tutorial problems • Assignment problems • Quizzes				

MODULE IX:	L	T	P	EL
	3	0	2	3
Crystal structures and packing factor (SC, BCC, FCC, Diamond) – Bragg's law – determination of crystal structures.				
SUGGESTED ACTIVITIES : • Mostly in Class • EL - Mini project for constructing crystal structures using softballs, Crystal structure parameters • Practical: Crystal structures: Classification and packing factor, Modelling of Diamond crystal structure				
SUGGESTED EVALUATION METHODS: • Assignment problems • Project demonstration and presentation (crystal structures)				
MODULE X:	**L**	**T**	**P**	**EL**
	3	**0**	**4**	**3**
Density of states – Fermi-Dirac statistics – Population of the conduction and valence bands - Fermi level – single crystal growth – epitaxy - process of integrated circuit production.				
SUGGESTED ACTIVITIES : • Combination of in class & Flipped • EL – Crystal growth techniques and IC process • Practical: Post office box: Determination of band gap of a semiconductor • Practical: Solution growth of crystal				
SUGGESTED EVALUATION METHODS: • Tutorial problems • Assignment problems • Quizzes				

REFERENCE BOOKS:

1. Richard Wolfson, "Essential University Physics", Second Edition, Addision-Wesley, 2012.
2. Narciso Garcia and Arthur Damask, "Physics for Computer Science Students", Springer-Verlag, 1991.
3. Neil Gershenfeld, "The Physics of Information Technology", Cambridge University Press, 2000.
4. Harris Benson, "University Physics", Wiley India, 2004.
5. P.A. Tipler and G.P. Mosca, "Physics for Scientists and Engineers with Modern Physics, W.H. Freeman, 2007.

OUTCOMES:

On Completion of the course, the students should be able to:

- Apply appropriate concepts of physics to solve problems.
- Acquire knowledge on the basics of properties of matter, optics, lasers, crystals.
- Appreciate the importance of physics of materials for various engineering applications.

EVALUATION METHOD TO BE USED:

Sl. no	Category of Courses	Continuous Assessment	Mid – Semester Assessment	End Semester
1.	**Theory Integrated with Practical**	**15(T) + 25 (P)**	**20**	**40**

MA6151 MATHEMATICS –I	L	T	P	EL	CREDITS
	3	1	0	3	5

OBJECTIVES:

- To gain proficiency in calculus computations.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To familiarize the student with functions of several variables.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

MODULE I SINGLE VARIABLE FUNCTIONS	L	T	P	EL
	3	1	0	3

Representation of functions - New functions from old functions - Limit of a function - Limits at infinity - Continuity.

SUGGESTED ACTIVITIES :

- Problem solving sessions

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE II DIFFERENTIALCALCULUS	L	T	P	EL
	3	1	0	3

Derivatives - Differentiation rules – intermediate theorem - Rolle's theorem- Maxima and Minima of functions of one variable.

SUGGESTED ACTIVITIES :

- Problem solving sessions
- Applications in real life problems

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE III FUNCTIONS OFSEVERALVARIABLES	L	T	P	EL
	3	1	0	3
Partial derivatives – Homogeneous functions and Euler's theorem – Total derivative – Differentiation of implicit functions – Change of variables – Jacobians				
SUGGESTED ACTIVITIES : • Problem solving sessions • Applications in real life problem**s**				
SUGGESTED EVALUATION METHODS: • Tutorial problems • Assignment problems • Quizzes				

MODULE IV MULTI VARIABLE DIFFERENTIAL CALCULUS	L	T	P	EL
	3	1	0	3
Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.				
SUGGESTED ACTIVITIES : • Problem solving sessions • Flipped Class room				
SUGGESTED EVALUATION METHODS: • Tutorial problems • Assignment problems • Quizzes				

MODULE V INTEGRALCALCULUS	L	T	P	EL
	3	1	0	3
Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts				
SUGGESTED ACTIVITIES : • Problem solving sessions				
SUGGESTED EVALUATION METHODS: • Tutorial problems • Assignment problems • Quizzes				

MODULE VI MORE ON INTEGRAL CALCULUS	L	T	P	EL
	3	1	0	3
Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals				
SUGGESTED ACTIVITIES : • Problem solving sessions				

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE VII MULTIPLEINTEGRALS	**L**	**T**	**P**	**EL**
	3	**1**	**0**	**3**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves

SUGGESTED ACTIVITIES :

- Problem solving sessions
- Flipped Class room

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE VIII VOLUME INTEGRALS	**L**	**T**	**P**	**EL**
	3	**1**	**0**	**3**

Triple integrals – Volume of solids – Change of variables in double and triple integrals.

SUGGESTED ACTIVITIES :

- Problem solving sessions

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE IX	**L**	**T**	**P**	**EL**
	3	**1**	**0**	**3**

Methods of variation of parameters – Method of undetermined coefficients -

SUGGESTED ACTIVITIES :

- Problem solving sessions

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE X:	**L**	**T**	**P**	**EL**
	3	**1**	**0**	**3**

Homogenous Equation of Euler‘s And Legendre‘s Type – System of Simultaneous Linear Differential Equations with Constant Coefficients.

SUGGESTED ACTIVITIES :

- Problem solving sessions

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

OUTCOMES:

After completing this course, students should demonstrate competency in the following skills:

- Use both the limit definition and rules of differentiation to differentiate functions.
- Apply differentiation to solve maxima and minima problems.
- Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
- Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
- Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
- Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.
- Apply various techniques in solving differential equations.

TEXTBOOKS:

1. James Stewart, "Calculus with Early Transcendental Functions", Cengage Learning, New Delhi,2008.
2. Narayanan S. and Manicavachagom Pillai T. K., "Calculus" Volume I and II,S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
3. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi,43rd Edition, 2014.

REFERENCES:

1. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint,2010.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, New Delhi,2014.
3. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition,2007.
4. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition,2009.
5. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education, New Delhi, 2nd Edition, 5th Reprint,2009.
6. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi,2007.

EVALUATION METHOD TO BE USED:

Sl. no	Category of Courses	Continuous Assessment	Mid – Semester Assessment	End Semester
1.	**Theory**	**40**	**20**	**40**

CS6101 PROGRAMMING WITH C	L	T	P	EL	CREDITS
	2	1	4	3	6

Prerequisites for the course: None

OBJECTIVES:

- To learn programming using a structured programming language.
- To implement programs using basic features of C.
- To learn to use C pointers and dynamically allocated memory techniques.
- To learn advanced features of the C programming language
- To be able to use file operations in C

MODULE I :	L	T	P	EL
	2	**1**	**4**	**3**

Notion of memory, addresses, variables, instructions, execution of instructions. Operating system commands, file editing, compiling, linking, executing a program.

SUGGESTED ACTIVITIES :

- Practical - Use of operating system commands and file editing operations.

SUGGESTED EVALUATION METHODS:

- Exercises on the use of operating system commands and file editing operations.

MODULE II :	L	T	P	EL
	2	**1**	**4**	**3**

Data types - constants, variables - arithmetic operators - expressions - basic input/output. Relational, logical, increment, decrement operators. Bitwise, assignment, conditional operators.

SUGGESTED ACTIVITIES :

- EL - Programs using integer type, arithmetic operators and basic input/output.
- EL - Programs using other data types and operators.
- Practical - Demonstration of programs using integer type, arithmetic operators and basic input/output.
- Practical - Demonstration of programs using other data types and operators.

SUGGESTED EVALUATION METHODS:

- Programs on integer type, arithmetic operators, basic input output.

MODULE III :	L	T	P	EL
	2	**1**	**4**	**3**

Statements and blocks - Selection - if-else construct - iteration - while - for constructs. The constructs else-if, switch, do-while, break, continue, enum. Pseudocode, Programming style.

SUGGESTED ACTIVITIES :

- EL: Programs using if-else, while, for.
- EL: Programs using else-if, switch, do-while, break, continue, enum. Use of pseudocode, programming style.
- Practical: Demonstration of programs using if else, while, for.
- Practical: Use of pseudocode. Demonstration of programs using else-if, switch, do-while, break, continue, enum, programming style.

SUGGESTED EVALUATION METHODS:

- Programs using if else, while, for.

MODULE IV :	L	T	P	EL
	4	2	8	6

Array, declaration, initialization. Multi dimensional arrays. Strings and character arrays, string operations on arrays.

SUGGESTED ACTIVITIES :

- EL - Programs using arrays and operations on arrays.
- Practical - Demonstration of programs using arrays and operations on arrays.
- EL - Programs implementing string operations on arrays.
- Practical - Demonstration of programs implementing string operations on arrays.

SUGGESTED EVALUATION METHODS:

- Evaluation: Programs using arrays and operations on arrays.
- Evaluation: Programs using strings and use of string library functions.
- Evaluation: Programs implementing string operations on arrays.

MODULE V :	L	T	P	EL
	4	2	8	6

Functions, definition, call, arguments, call by value. Call by reference. Recursion. Call stack. Header files, static variables, external variables.

SUGGESTED ACTIVITIES :

- EL - Programs using functions.
- Practical - Demonstration of programs using functions.
- EL - Programs using recursion.
- Practical - Demonstration of programs using recursion.

SUGGESTED EVALUATION METHODS:

- Evaluation: Programs using functions.
- Evaluation: Programs using recursion.

MODULE VI:	L	T	P	EL
	6	3	12	9

Pointers and arrays - address arithmetic. Dynamic Memory Allocation - Two dimensional arrays and pointers. Pointers and strings, string library functions. Pointers to functions.

SUGGESTED ACTIVITIES :

- EL - Programs using pointers and arrays, address arithmetic.
- Practical - Demonstration of programs using pointers and arrays, address arithmetic..
- EL - Programs using Dynamic Memory Allocation, two dimensional arrays and pointers.
- Practical - Demonstration of programs using Dynamic Memory Allocation, two dimensional arrays and pointers.
- EL - Programs using Pointers and strings..
- Practical - Demonstration of programs using pointers and strings.

SUGGESTED EVALUATION METHODS:

- Evaluation: Programs on pointers and arrays, address arithmetic..
- Evaluation: Programs using Dynamic Memory Allocation, two dimensional arrays and pointers.
- Evaluation: Programs using pointers and strings.

MODULE VII:	**L**	**T**	**P**	**EL**
	4	**2**	**8**	**6**

Structures, Structures and arrays. Pointers to structures, Self referential structures. Enumeration types, Unions, bit fields, typedefs.

SUGGESTED ACTIVITIES :

- EL - Programs using structures and arrays.
- Practical - Demonstration of programs using Structures and arrays.
- EL - Programs using Pointers to structures, Self referential structures.
- Practical - Demonstration of programs using pointers to structures, Self referential structures.

SUGGESTED EVALUATION METHODS:

- Evaluation: Programs using Structures and arrays.
- Evaluation: Programs using pointers to structures, self referential structures.

MODULE VIII:	**L**	**T**	**P**	**EL**
	2	**1**	**4**	**3**

Files - binary, text - open, read, write, random access, close. Preprocessor directives. Command line arguments.

SUGGESTED ACTIVITIES :

- EL - Programs using file operations in real-world applications.
- Practical - Demonstration of real-world application using file operations.

SUGGESTED EVALUATION METHODS:

- Evaluation: Demonstration of real-world application.

TEXT BOOKS:

1. Reema Thareja, “Programming in C”, 2nd ed., Oxford University Press, 2016.
2. Brian W. Kernighan and Dennis M. Ritchie, “The C Programming Language”, Pearson Education, 1988.
3. Brian W. Kernighan and Rob Pike, “The Practice of Programming” (Chap 1), Pearson Education, 1999.

REFERENCES:

1. Pradip Dey and Manas Ghosh, “Computer Fundamentals and Programming in C”, 2nd ed., Oxford University Press, 2013.
2. Yashavant Kanetkar, “Let us C”, 15th ed., BPB Publications, 2017.
3. Paul J. Deitel and Harvey Deitel, “C How to Program”, 7th ed., Pearson Education, 2013.

OUTCOMES:

On Completion of the course, the students should be able to:

- Apply appropriate programming constructs to solve problems.
- Write C programs for simple applications.
- Use C pointers and dynamically allocated memory to solve complex problems.
- Know advanced features of the C programming language.
- Apply file operations to develop solutions for real-world problems.

EVALUATION METHOD TO BE USED:

Continuous assessment	Mid term	End Semester
40 (P)	**20**	**40**

	L	T	P	EL	CREDITS
CS6102 COMPUTATIONAL THINKING	**0**	**0**	**4**	**3**	3

Prerequisites for the course: None

OBJECTIVES:

- To formulate problems in a way that enables the use of a computer to solve them.
- To logically organize and analyze data.
- To automate solutions through algorithmic thinking.
- To identify, analyze and implement possible solutions with the goal of achieving the most efficient and effective combination of steps and resources.
- To generalize and transfer this problem solving process to wide variety of problems.

MODULE I :	L	T	P	EL
	0	0	4	3

Algorithmic thinking - creating oral algorithms for everyday tasks - Data abstraction and representation - Abstraction and translation of everyday data for use on a computer.

SUGGESTED ACTIVITIES :

- Explore algorithm design by creating oral algorithms.
- Abstract the essential details of everyday objects.
- Translate the description of everyday objects into data types and variables.

SUGGESTED EVALUATION METHODS:

- Evaluation of the oral algorithms and computer data.

MODULE II :	L	T	P	EL
	0	**0**	**12**	**9**

Decomposing a complex problem - Strategies for decomposition and algorithm design - Divide and conquer - Simple program implementations.

SUGGESTED ACTIVITIES :

- Decompose a complex problem into discrete steps,
- Design a simple algorithm for solving the problem.
- External learning: Study of different strategies for decomposition and algorithm design.
- Examine sample input and expected output and develop strategies to decompose the problem.
- Use decomposition to break the problem into smaller problems and algorithmic design to plan a solution strategy.
- External learning: Simple program implementations.

SUGGESTED EVALUATION METHODS:

- Whiteboard presentations of the decomposition and algorithm.
- Evaluation of the developed strategies.
- Demonstration of the implemented programs.

MODULE III :	**L**	**T**	**P**	**EL**
	0	**0**	**8**	**6**

Overall data representation, abstraction, analysis and algorithm design. Program implementations.

SUGGESTED ACTIVITIES :

- Examples of Data representation, abstraction, analysis and algorithm design.
- Programming implementation.

SUGGESTED EVALUATION METHODS:

- Whiteboard presentations of the Data analysis and Algorithm design.
- Demonstration of the programming implementations.

MODULE IV:	**L**	**T**	**P**	**EL**
	0	**0**	**8**	**6**

Measuring the complexity of an algorithm - sorting algorithms - the notion of unsolvable problems. Programming illustrations.

SUGGESTED ACTIVITIES :

- Develop algorithms for sorting and determine the complexity of the algorithm and how it scales as the number of items to sort increases.
- Implement the different algorithms and measure how they scale.
- Determine which algorithms are more efficient, whether or not all algorithms are calculable given enough time.

SUGGESTED EVALUATION METHODS:

- Determine complexity of algorithms and how they scale with number of items.
- Demonstration using appropriate programs.
- Determine which algorithms are computable given enough time.

MODULE V:	**L**	**T**	**P**	**EL**
	0	**0**	**4**	**3**

Enhancing the clarity of a program - documentation, style, idioms.

SUGGESTED ACTIVITIES :

- External Learning: Study the best practices of documentation, style, idioms, etc that are used to ensure the code can be understood and maintained over a long period.
- Use these practices in the documentation of earlier programs.

SUGGESTED EVALUATION METHODS: • Documentation of given programs.				
MODULE VI:	**L**	**T**	**P**	**EL**
	0	**0**	**9**	**9**
Application of computational thinking to simple real world problems - program implementation of decomposed modules.				
SUGGESTED ACTIVITIES : • Application to simple real world problems.				
SUGGESTED EVALUATION METHODS: • Evaluation of the solutions to the real world problems				

REFERENCES:

1. Exploring Computational Thinking.
https://edu.google.com/resources/programs/exploring-computational-thinking/

OUTCOMES:

On Completion of the course, the students should be able to:

- Abstract out details of data and represent them appropriately.
- Create appropriate algorithms to solve specified problems.
- Confidently deal with complexity and open-ended problems.
- Apply the computational thinking skills to real world problems.
- Use best practices for documentation that can ensure long term maintenance.

EVALUATION METHOD TO BE USED:

Continuous assessment	Mid term	End Semester
60	**40**	-

HS6251		TECHNICAL ENGLISH II	L T P EL C 4 0 0 3 5
MODULE 1	**GIVING INSTRUCTIONS AND MAKING RECOMMENDATIONS**	**Oral Fluency**: giving oral instructions and recommendations to carry out short processes. (e.g. how to maintain a smart phone)-**Language Focus:** use of imperatives and modal verbs (linguistic acts of instructing and recommending)-**Lexical Development**: learning content-related vocabulary-derivatives-functional variations (use of affixes)-stress shift-**Reading Comprehension**: language of advertising-(features)-passages discussing the uses of any particular product-**Listening**- to a product description and listing the uses of the product-**Writing-** designing an advertisement (language component of about 70-100 words)	At the end of the module, students should be able to: • Give instructions and make recommendations • Articulate sounds in English with appropriate stress shift in accordance with the meaning and grammar of words

		SUGGESTED ACTIVITIES	**SUGGESTED EVALUATION METHODS**
		• Lectures on the Communicative aspects of language use. • Practical-Listening, Speaking and Writing	• Quizzes • Assignments • Small Group Work
			12 0 0 9
MODULE 2	**ASKING AND ANSWERING QUESTIONS**	**Oral Fluency:** short conversations (informal) in academic institutions – Group discussions – Role play Activity -**Language Focus:** speech acts (illocutionary force; making inferences) study of language in context- framing questions (asking & answering questions) - **Lexical Development-**learning specialist vocabulary related to reading texts-**Reading-**dialogues and interviews (e.g. interviews with famous personalities)-**Writing:** dialogue writing-introduction to e-mail writing (personal)	At the end of the module, students should be able to: • Participate in conversations in informal contexts • Learn to use specialist vocabulary in appropriate contexts.
		SUGGESTED ACTIVITIES	**SUGGESTED EVALUATION METHODS**
		• Lectures on the Communicative aspects of language use. • Practical-Listening, Speaking and Writing	• Quizzes • Assignments • Small Group Work
			12 0 0 9

MODULE 3	**ASKING AND ANSWERING QUESTIONS**	**Oral Fluency**: making power point presentations (modus operandi to be given)-debating skills-**Language Focus**- use of adjectival and adverbial forms-**Lexical Development:** content related vocabulary -Use of abbreviations and acronyms-**Reading-**passages on making presentations and making notes - preparation of slides-**Writing** - practice in note making and note taking- **Listening** – watching a presentation and completing a worksheet	At the end of the module, students should be able to: • Make professional Power Point Presentations • Use note making and note taking skills effectively
		SUGGESTED ACTIVITIES	**SUGGESTED EVALUATION METHODS**
		• Lectures on the Communicative aspects of language use. • Practical-Listening, Speaking and Writing	• Quizzes • Assignments • Power Point Presentations • Small Group Work
			12 0 0 9
MODULE 4	**ELABORATING ON ONE'S QUALIFICATIONS AND ACHIEVEMENTS**	**Oral Fluency:** Oral Fluency: SWOT analysis- **Role Play:** going abroad for work assignments-**Language Focus**: active voice-use of punctuation marks-simple past and simple present perfect tenses-**Lexical Developmen**t: specialist vocabulary (letter writing)-**Reading** – vision statement-work summary-job application-statement of purpose- **Listening:** listening to a talk and making notes- **Writing-** applying for a job (letter& e-mail) - bio data/resume	At the end of the module, students should be able to: • Write a job application and draw a suitable bio data forms • Read and understand the purposes of different types of writing

		SUGGESTED ACTIVITIES	**SUGGESTED EVALUATION METHODS**
		• Lectures on the Communicative aspects of language use. • Practical-Listening, Speaking and Writing	• Quizzes • Assignments • Power Point Presentations • Small Group Work
			12 0 0 9
MODULE 5	**WRITING PROJECT REPORTS**	**Oral Fluency**: Asking and answering questions (e.g. discussion on training received in school/imaginary training programme) **Language Focus:** direct and indirect forms of narration-use of simple past and past continuous tense forms of verbs-use of modal verbs-formation of questions (interrogative and yes/no type of questions)-passive voice-**Lexical Development**: factual vs. emotive use of vocabulary-reporting verbs-**Reading:** industry /internship report-**Writing:** report on a training programme (model to be provided)-**Listening:** to a report and completing a worksheet	At the end of the module, students should be able to: • Ask and answer different types of questions • Write a purpose-oriented, factual, report
		SUGGESTED ACTIVITIES	**SUGGESTED EVALUATION METHODS**
		• Lectures on the Communicative aspects of language use. • Practical-Listening, Speaking and Writing	• Quizzes • Assignments • Power Point Presentations • Small Group Work
			12 0 0 9

METHODS TO BE USED DURING CLASSROOM TEACHING

The following methods would be used to achieve programme objectives.

For language skills development:

1. Focus on fluency first for students with limited proficiency. Students would first develop the confidence to express themselves without being inhibited by errors.
2. Guided activities for speaking and writing with vocabulary and information provided as input.
3. Focus on simplicity and clarity than on the use of unnecessarily complex sentences and high-sounding words. Focus on clear organization of any spoken or written message.
4. Adequate preparation time given for demonstration of skills.
5. Sensitivity to issues of shyness and introversion and avoiding coercive methods.
6. Use of relevant techno- social topics on which students have opinion.
7. Use of listening and reading to improve vocabulary.
8. Peer evaluation using feedback templates to allow students to practice in small groups on their own. A session with 30 students needs to allow adequate opportunity to all students.
9. Teacher correction of individual writing scripts with feedback.

FOR COMMUNICATION SKILLS DEVELOPMENT:

1. Focus on essential and time- tested principles of communication that are applicable in most contexts.
2. Avoiding formulae but providing basic templates that can be adapted to situations.
3. Avoiding complex behavioral theories or pop psychology as communication guides.
4. Using situations that students would typically encounter on campus and later at work.
5. Gradual building of confidence by progressing from communication in front of small groups to communication in front of larger groups.

ASSESSMENT

Skills other than speaking would be tested using a paper and pencil test. Speaking skills will be tested using a verbal test.

TEXTBOOK:

1. ENGLISH Today: Technical Communication for Science, Engineering and Technology. Board of Editors, Department of English, Anna University. Orient Black Swan (Volumes 1&2) 2017.

REFERENCES:

1. Learning to Communicate: Dr. V. Chellammal, Allied Publishers, 2002.
2. English for Technical Communication: N.P. Sudharshana, C. Savitha, Cambridge University Press, 2016.

EVALUATION METHOD TO BE USED:

Sl. no	Category of Courses	Continuous Assessment	Mid –Semester Assessment	End Semester
1.	**Theory**	**40**	**20**	**40**

CY6251 ENGINEERING CHEMISTRY	L	T	P	EL	CREDITS
	3	0	2	3	5

OBJECTIVES:

- To develop an understanding about fundamentals of polymer chemistry, preparation and properties of polymers
- To acquire knowledge in photochemistry and spectroscopy
- To understand the concepts of surface chemistry and catalysis.
- To impart basic knowledge on chemical thermodynamics.
- To get acquainted with the basic concepts of nano chemistry.
- To understand the chemistry of the fabrication of integrated circuits
- To know the types of specialty materials used in the electronics/electrical industry.

MODULE I :	L	T	P	EL
	3	0	2	3

Polymer Chemistry: Introduction: Functionality; Classification of Polymers- Natural and Synthetic, Thermoplastic and Thermosetting. Types and Mechanism of Polymerization: Addition (Free Radical, Cationic, Anionic and Living); Condensation and Copolymerization. Piezo and pyro electric polymers; Photoresists – Positive and negative.

SUGGESTED ACTIVITIES :

- In Class activity for Functionality and Mechanism of polymerisation
- Practical – Thermal free radical polymerisation of styrene/MMA

SUGGESTED EVALUATION METHODS:

- Tutorial : Deduce type of polymer from monomers with different functionalities
- Assignment : Predicting mechanism of polymerization for few important monomers
- Quizzes

MODULE II :	L	T	P	EL
	3	0	2	3

Properties of Polymers: T_g, Tacticity, Degree of Polymerization & Molecular Weight - Weight Average, Number Average and Polydispersity Index. Techniques of Polymerization: Bulk, Emulsion, Solution and Suspension

SUGGESTED ACTIVITIES :

- Flipped classroom and activity
- Proofs and Simplification in class
- Practical – Determination of molecular weight of PVA using Ostwald viscometer

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE III :	L	T	P	EL
	3	0	2	3

Photochemistry: Electromagnetic Radiation - Laws of Photochemistry - Grotthuss-Draper Law, Stark-Einstein Law and Lambert-Beer Law. Photo Processes - Internal Conversion, Inter-System Crossing, Fluorescence, Phosphorescence, Chemiluminescence and Photo-Sensitization.

SUGGESTED ACTIVITIES :

- Evaluate quantum efficiency for different systems
- Photo Processes – in class and EL based on that
- Practical – Estimation of sodium in water sample by flame photometry

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE IV :	**L**	**T**	**P**	**EL**
	3	**0**	**2**	**3**

Spectroscopy: Absorption of Radiation-Electronic, Vibrational and Rotational Transitions. Width and Intensities of Spectral Lines. Spectrophotometric Estimation Of Iron. UV-Vis and IR Spectroscopy-Principles, Instrumentation (Block Diagram) and Applications

SUGGESTED ACTIVITIES :

- Flipped Class room
- Types of electronic/vibrational transitions for different molecules – in class and EL based on that
- Practical – Estimation of iron in water sample by spectrophotometry

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE V :	**L**	**T**	**P**	**EL**
	3	**0**	**2**	**3**

Adsorption-Types of Adsorption-Adsorption of Gases on Solids- Adsorption from Solutions- Types of Isotherms – Frendlich Adsorption Isotherm, Langmuir Adsorption Isotherm. Industrial Applications of Adsorption.

SUGGESTED ACTIVITIES :

- Industrial applications in class
- EL – Adsorption of gases on solids
- Practical – Adsorption of acetic acid/oxalic acid on charcoal – verification of Freundlich's adsorption isotherm.

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment
- Quizzes

MODULE VI:	**L**	**T**	**P**	**EL**
	3	**0**	**2**	**3**

Catalysis: Characteristics and Types of Catalysts-Homogeneous and Heterogeneous, Auto Catalysis. Enzyme Catalysis - Factors Affecting Enzyme Catalysis, Michaelis - Menton Equation. Industrial Applications of Catalysts

SUGGESTED ACTIVITIES :

- Introduction in class
- Analysis in Class
- Flipped Classroom for further study

- Practical – Determination of rate constant of acid catalysed hydrolysis of an ester

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment
- Quizzes

MODULE VII:	**L**	**T**	**P**	**EL**
	3	**0**	**2**	**3**

Second Law: Entropy-Entropy of Phase Transitions; Free Energy- Gibbs-Helmholtz Equation; Clausius Clapeyron Equation; Van't Hoff Isotherm and Isochore. Chemical Potential; Gibbs-Duhem Equation- Variation of Chemical Potential with Temperature and Pressure.

SUGGESTED ACTIVITIES :

- Combinations of in Class & Flipped class rooms
- Practical – Phase change in a solid.
- EL - HDL descriptions

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE VIII:	**L**	**T**	**P**	**EL**
	3	**0**	**2**	**3**

Nano chemistry - Basics-Distinction between Molecules, Nanoparticles and Bulk Materials; Size-Dependent Properties. Preparation of Nanoparticles – Sol-Gel and Solvo - thermal. Preparation of Carbon Nanotube by Chemical Vapour Deposition and Laser Ablation. Preparation of Nanowires by Electrochemical Deposition and Electro Spinning. Properties and Uses of Nanoparticles, Nanoclusters, Nanorods, Nanotubes and Nanowires.

SUGGESTED ACTIVITIES :

- Combinations of in Class & Flipped class rooms
- EL – Properties and uses of Nanowires, nanoclusters, nanorods, nanowires
- Practical - Preparation of nano wire by electrospinning

SUGGESTED EVALUATION METHODS:

- Tutorial
- Assignment
- Quizzes

MODULE IX:	**L**	**T**	**P**	**EL**
	3	**0**	**2**	**3**

Fabrication of integrated circuits: Introduction – Fabrication – MOS – NMOS, PMOS, CMOS, Ga-As Technologies, Printed circuit boards-Fabrication (Single layer only) – Lamination, printing (photo and screen printing) and
mechanical operation.

SUGGESTED ACTIVITIES :

- Mostly in Class
- EL - Mini project for Lamination by Hand lay up Technique
- Practical – Determination of total, temporary and permanent hardness of water by EDTA method

SUGGESTED EVALUATION METHODS: • Assignment problems • Project demonstration and presentation				
MODULE X:	**L**	**T**	**P**	**EL**
	3	**0**	**2**	**3**
Specialty Materials: Dielectrics & insulating materials – Characteristics; Ceramics – Mica and glass; Magnetic materials – basis of magnetism – Soft and hard magnetic materials; Composites : Classification – Particulate, fibrous and laminated composites – Hybrid composites – Application of composites in electrical and electronic components; Semiconductors – Extensive and intensive; Metallic solids –Characteristics.				
SUGGESTED ACTIVITIES : Combination of in class & Flipped				
SUGGESTED EVALUATION METHODS: • Tutorial • Assignment • Quizzes				

PREREQUISITES FOR THE COURSE:

Laboratory facilities to carry out the experiments mentioned in each of the modules – Thermal free radical polymerisation of styrene/MMA,Determination of molecular weight of PVA using Ostwald viscometer, Estimation of sodium in water sample by flame photometry, Estimation of iron in water sample by spectrophotometry, Adsorption of acetic acid/oxalic acid on charcoal – verification of Freundlich's adsorption isotherm, Determination of rate constant of acid catalysed hydrolysis of an ester, Phase change in solid, Electrospinning, Total and temporary hardness.

OUTCOMES

On Completion of the course, the students should be able to:

- Identify the different types of polymers, polymerisation processes and some special properties and applications of polymers.
- Identify suitable adsorbents/ adsorption process and catalysts for pollution abatement and other industrial processes.
- Discuss the concepts involved in the absorption of radiation by materials and various photophysical processes, polymer chemistry, surface chemistry and catalysis.
- Point out the spectral techniques for qualitative and quantitative analysis & thermodynamics of various processes.
- Discuss the importance of the nano materials (and their superiority over conventional materials), feasibility of their preparation and uses
- Elaborate on various technologies for the fabrication of integrated circuits & specialty materials in the electronics/electrical industry

TEXT BOOKS:

1. Jain P.C and Monika Jain, "Engineering Chemistry", Dhanpet Rai Publishing Company (P) Ltd.,New Delhi, 2013.
2. Wong M.N., "Polymer for electronics and photonic applications", John Wiley, New York, 2006.

REFERENCES:

1. Sivasankar B., “Engineering Chemistry”, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012
2. Vairam S., Kalyani P., Suba Ramesh., “Engineering Chemistry”, Wiley India Pvt Ltd., New Delhi., 2011.
3. Khanna O.P.,” Material Science” NIH Publications, 2007.

EVALUATION METHOD TO BE USED:

Continuous assessment	Mid term	End Semester
15(T) + 25 (P)	20	40

MA6251 DISCRETE MATHEMATICS	L	T	P	EL	CREDITS
	3	1	0	3	5

MODULE I LOGIC	L	T	P	EL
	3	1	0	3

Propositional Logic – Propositional equivalences - Predicates and Quantifiers – Nested Quantifiers

SUGGESTED ACTIVITIES :

- Problem Solving sessions

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE II PROOFS	L	T	P	EL
	3	1	0	3

Rules of inference - Introduction to proofs – Proof methods and strategy.

SUGGESTED ACTIVITIES :

- Problem Solving sessions
- Applications in real life problems

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE III COMBINATORICS	L	T	P	EL
	3	1	0	3

Mathematical induction – Strong induction and well ordering – The basics of counting - The pigeonhole principle- Permutations and Combinations

SUGGESTED ACTIVITIES :

- Problem Solving sessions
- Applications in real life problems

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE IV RECURRENCES	L	T	P	EL
	3	1	0	3

Recurrence relations -Solving linear recurrence relations using generating functions – Inclusion - Exclusion Principle and its applications.

SUGGESTED ACTIVITIES :

- Problem Solving sessions
- Applications in real life problems

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE V GRAPH THEORY	L	T	P	EL
	3	1	0	3

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

SUGGESTED ACTIVITIES :

- Problem Solving sessions
- Flipped class room
- Applications in real life problems

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE VI ALGEBRAIC STRUCTURE 1	L	T	P	EL
	3	1	0	3

Algebraic systems – Semi groups and monoids – Groups - Subgroups - Homomorphisms

SUGGESTED ACTIVITIES :

- Problem Solving sessions
- Applications in real life problems

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE VII ALGEBRAIC STRUCTURE 2	L	T	P	EL
	3	1	0	3
Normal subgroup and coset - Lagrange‟s theorem – Definitions and examples of Rings and Fields				
SUGGESTED ACTIVITIES : • Problem Solving sessions • Flipped Class room				
SUGGESTED EVALUATION METHODS: • Tutorial problems • Assignment problems • Quizzes				

MODULE VIII LATTICES	L	T	P	EL
	3	1	0	3
Partial ordering – Posets – Lattices as Posets – Properties of lattices - Lattices as algebraic systems – Sub lattices				
SUGGESTED ACTIVITIES : • Problem Solving sessions • Applications in real life problems				
SUGGESTED EVALUATION METHODS: • Tutorial problems • Assignment problems • Quizzes				

MODULE IX BOOLEAN ALGEBRA	L	T	P	EL
	3	1	0	3
Direct product and Homomorphism – Some special lattices – Boolean algebra				
SUGGESTED ACTIVITIES : • Problem Solving sessions • Applications in real life problems				
SUGGESTED EVALUATION METHODS: • Tutorial problems • Assignment problems • Quizzes				

OUTCOMES:

On Completion of the course, the students should be able to:

- Identify techniques to test the logic of a program.
- Identify structures at many levels.
- Work with a class of functions which transform a finite set into another finite set which relates to input and output functions in Computer Science.
- Discuss the counting principles.
- Point out the properties of algebraic structures such as groups, rings and fields.

TEXT BOOKS:

1. Kenneth H.Rosen, “Discrete Mathematics and its Applications”, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 7th Edition, Special Indian edition, 2011.
2. Tremblay J.P. and Manohar R, “Discrete Mathematical Structures with Applications to Computer Science”, Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011. 22.
3. Susanna S. Epp, “Discrete Mathematics with Applications” Cengage Learning, New Delhi, 8th Edition, 2016.

REFERENCES:

1. Ralph. P. Grimaldi, “Discrete and Combinatorial Mathematics: An Applied Introduction”, Pearson Education Asia, Delhi, 4th Edition, 2007.
2. Thomas Koshy,” Discrete Mathematics with Applications”, Elsevier Publications, 2006. 3
3. Seymour Lipschutz and Mark Lipson, ”Discrete Mathematics”, Schaum‟s Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.

	L	T	P	EL	CREDITS
GE6251 ENGINEERING GRAPHICS	**2**	**0**	**4**	**3**	**5**

OBJECTIVES

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

MODULE I :	**L**	**T**	**P**	**EL**
	2	**0**	**4**	**3**

Importance of Graphics in Engineering Applications – Use of Drafting Instruments – BIS Conventions and Specifications – Size, Layout and Folding of Drawing Sheets – Lettering and Dimensioning.

SUGGESTED ACTIVITIES :

- Demonstration using CAD software to bring out the concepts presented in the subject
- Hands on practicals on open source software

SUGGESTED EVALUATION METHODS:

- Quizzes

MODULE II :	**L**	**T**	**P**	**EL**
	2	**0**	**4**	**3**

Basic Geometrical Constructions, Curves used in Engineering Practices - Conics –Construction of Ellipse,Parabola and Hyperbola by Eccentricity Method – Construction of Cycloid – Construction of Involutes of Square and Circle – Drawing of Tangents and Normal to the above Curves.

SUGGESTED ACTIVITIES :

- Videos of application of Geometric curves in various domains
- Theory and mathematics in class
- EL – Practical Problems
- Practical –Construction of curves

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE III :	**L**	**T**	**P**	**EL**
	2	**0**	**4**	**3**

Visualization Concepts and Free Hand Sketching: Visualization Principles – Representation of Three Dimensional Objects – Layout of Views - Free Hand Sketching of Multiple Views from Pictorial Views of

Objects

SUGGESTED ACTIVITIES :

- Building models using various media
- Discussing uses of multiple views in various fields
- Practical - Construction of 3D views

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE IV :	**L**	**T**	**P**	**EL**
	2	**0**	**4**	**3**

Orthographic Projection- Principles - Principal Planes - First Angle Projection - Projection of Points. Projection of Straight Lines (only First Angle Projections) Inclined to Both the Principal Planes - Determination of True Lengths and True Inclinations by Rotating Line Method and Trapezoidal Method and Traces

SUGGESTED ACTIVITIES :

- Videos of application of projections in various domains
- Theory and mathematics in class
- EL – Practical Problems in orthographic projection of points
- Practical –Construction of curves

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE V :	**L**	**T**	**P**	**EL**
	2	**0**	**4**	**3**

Projection of Planes (Polygonal and Circular Surfaces) Inclined to both the Principal Planes by Rotating Object Method.

SUGGESTED ACTIVITIES :

- Videos of application of projections in various domains
- Theory and mathematics in class
- EL – Practical Problems in orthographic projection of planes

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE VI:	**L**	**T**	**P**	**EL**
	2	**0**	**4**	**3**

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 and Auxiliary Plane Method.

SUGGESTED ACTIVITIES :

- Introduction in class
- Models making
- Videos/software demonstrations

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

MODULE VII	L	T	P	EL
	2	0	4	3
Sectioning of Solids 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.				
SUGGESTED ACTIVITIES : • Introduction in class • Models • Videos */*software demonstrations				
SUGGESTED EVALUATION METHODS: • Tutorial problems • Assignment problems • Quizzes				
MODULE VIII	**L**	**T**	**P**	**EL**
	2	**0**	**4**	**3**
Development of Lateral Surfaces of Simple and Sectioned Solids – Prisms, Pyramids Cylinders and Cones. Development of Lateral Surfaces of Solids with Cut-Outs and Holes.				
SUGGESTED ACTIVITIES : • Development models in cardboard • Software demonstration				
SUGGESTED EVALUATION METHODS: • Tutorial problems • Assignment problems • Quizzes				
MODULE IX:	**L**	**T**	**P**	**EL**
	2	**0**	**4**	**3**
Principles of Isometric Projection – Isometric Scale – Isometric Projections of Simple Solids and Truncated Solids - Prisms, Pyramids, Cylinders, Cones - Combination of Two Solid Objects in Simple Vertical Positions and Miscellaneous Problems.				
SUGGESTED ACTIVITIES : • Videos • Demonstrations using Solid modeling software				
SUGGESTED EVALUATION METHODS: • Assignment problems • Quizzes				
MODULE X	**L**	**T**	**P**	**EL**
	2	**0**	**4**	**3**
Perspective Projection of Simple Solids - Prisms, Pyramids and Cylinders by Visual Ray Method and Vanishing Point Method.				
SUGGESTED ACTIVITIES : • Videos • Illustration using Advertisements				
SUGGESTED EVALUATION METHODS: • Tutorial problems • Assignment problems • Quizzes				

OUTCOMES:

On Completion of the course the student will be able to

- Perform free hand sketching of basic geometrical shapes and multiple views of objects.
- Draw orthographic projections of lines, planes and solids
- Obtain development of surfaces.
- Prepare isometric and perspective views of simple solids.

TEXT BOOK:

1. N.D.Bhatt and V.M.Panchal, “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.

REFERENCES:

1. K.R.Gopalakrishna., “Engineering Drawing” (Vol I&II combined) SubhasStores, Bangalore, 2007
2. Luzzader, Warren.J., and Duff,John M.,,’’ Fundamentals of Engineering Drawingwith an introduction to Interactive Computer Graphics for Design and Production”,Eastern Economy Edition, Prentice Hall of India Pvt Ltd, New Delhi, 2005
3. M.B.Shah and B.C.Rana, “Engineering Drawing”, Pearson, 2nd Edition, 2009
4. K.Venugopal and V.Prabhu Raja, “Engineering Graphics”, New Age International (P)Limited ,2008.
5. K. V.Natarajan, “A text book of Engineering Graphics”, 28th Edition, Dhanalakshmi Publishers, Chennai, 2015.
6. BasantAgarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
7. N.S Parthasarathy and Vela Murali, “ Engineering Drawing”, Oxford University Press, 2015.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

EVALUATION METHOD TO BE USED:

Sl. no	Category of Courses	Continuous Assessment	Mid – Semester Assessment	End Semester
1.	**Theory**	**40**	**20**	**40**

CS6103 APPLICATION DEVELOPMENT PRACTICES	L	T	P	EL	TOTAL	CREDITS
	1	0	4	3	8	4

OBJECTIVES:

- To introduce students to programming languages and techniques associated with the world wide web and thereby create interest in programming even to students with little programming knowledge
- To introduce tools for creating interactive web pages
- To introduce the client-server architecture
- To introduce databases

MODULE I :	L	T	P	EL
	1	0	4	3

Design of webpages – Use of Cascading style sheets to style the way a webpage looks

SUGGESTED ACTIVITIES :

- EL – Learn to use CSS

SUGGESTED EVALUATION METHODS:

- Demonstration of designed webpages
- Evaluation of the preparation done in learning CSS syntax

MODULE II :	L	T	P	EL
	1	0	4	3

Incorporating multimedia into a webpage (Text / Audio / Image / Video / Animation)

SUGGESTED ACTIVITIES :

- EL – Learn how to read information from a file/array and display on the webpage

SUGGESTED EVALUATION METHODS:

- Demonstration of having incorporated multimedia in a webpage

MODULE III :	L	T	P	EL
	1	0	4	3

Writing client side scripts using Javascript / Angular JS
Client side validation

SUGGESTED ACTIVITIES :

- EL – Learn to use Javascript / Angular JS

SUGGESTED EVALUATION METHODS:

- Demonstration of using client side validation for designed web browsers

MODULE IV:	L	T	P	EL
	1	0	4	3

Designing a static website using content management frameworks

SUGGESTED ACTIVITIES :

- EL – Familiarity with any one content management framework

SUGGESTED EVALUATION METHODS:

- Evaluation of the preparation done in getting familiarized with a content management framework

MODULE V :	**L**	**T**	**P**	**EL**
	1	**0**	**4**	**3**
Understanding servers – Server login, Database connectivity				
SUGGESTED ACTIVITIES : • EL- Overview of databases				
SUGGESTED EVALUATION METHODS: • Quiz on servers and overview of databases				
MODULE VI:	**L**	**T**	**P**	**EL**
	4	**0**	**0**	**2**
Use queries for fetching from database Processing the results of queries File upload/download File streaming				
SUGGESTED ACTIVITIES : • EL - SQL queries to create table, select, update and insert				
SUGGESTED EVALUATION METHODS: • Quiz on SQL queries • Demonstration of the use of queries				
MODULE VII:	**L**	**T**	**P**	**EL**
	1	**0**	**4**	**3**
Server side scripts and validation				
SUGGESTED ACTIVITIES : • EL – Learn how to write server side scripts				
SUGGESTED EVALUATION METHODS: • Demonstration of the use server side scripts				
MODULE VIII:	**L**	**T**	**P**	**EL**
	1	**0**	**4**	**3**
Development of web application				
SUGGESTED ACTIVITIES : • EL - Select an application for which webpage has to be developed. List the features to be included.				
SUGGESTED EVALUATION METHODS: • Oral explanation of the web application to be developed				
MODULE iX:	**L**	**T**	**P**	**EL**
	1	**0**	**4**	**3**
Development of web application				
SUGGESTED ACTIVITIES : • EL – Application of what was learnt in the previous weeks and develop the webpage				
SUGGESTED EVALUATION METHODS: • Demonstration of developed web application				

OUTCOMES:

At the end of the course the students

- Will be able to develop interactive websites
- Will learn the use of databases
- Will understand and appreciate the use of the client-server architecture

REFERENCES:

1. Scobey, Pawan Lingras, “Web Programming and Internet Technologies An E-Commerce Approach”, Second Edition, Jones & Bartlett Publishers, 2016.

EVALUATION METHOD TO BE USED:

Sl. no	Category of Courses	Continuous Assessment	Mid – Semester Assessment	End Semester
1.	Practical Integrated with Theory	40(P)	20(T)	40(P)