

## E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai

Accredited by NAAC with 'A' Grade | Accredited by NBA (CSE, EEE, MECH)

NAGAPATTINAM – 611 002



### B.E MECHANICAL ENGINEERING

#### First Year – Second Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
<b>Theory Course</b>								
1901MA204	Engineering Mathematics – II (Calculus, Ordinary Differential Equations and Complex Variable)	3	2	0	4	40	60	100
1901CH203	Materials Chemistry	3	0	0	3	40	60	100
1901GEX03	Programming for Problem Solving	3	0	0	3	40	60	100
1901ENX01	English for Engineers	2	0	0	2	40	60	100
1901GE201	Engineering Exploration	2	0	0	2	40	60	100
<b>Laboratory Course</b>								
1901CHX51	Engineering Chemistry Lab	0	0	2	1	50	50	100
1901GE253	Basic Workshop Lab	0	0	2	1	50	50	100
1901GEX52	Computer Programming Lab	0	0	2	1	50	50	100
1901HSX51	Communication Skill Lab	0	0	2	1	50	50	100
1901GE252	Engineering Intelligence - II	0	0	2	1	100	0	100

L – Lecture | T – Tutorial | P – Practical | CA – Continuous Assessment | ES – End Semester

<b>1901MA204</b>	<b>Engineering Mathematics – II (Calculus, Ordinary Differential Equations and Complex Variable)</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>					
					<b>3</b>	<b>2</b>	<b>0</b>	<b>4</b>					
<b>MODULE I</b>	<b>LAPLACE TRANSFORM</b>							<b>12 Hours</b>					
Laplace Transform – Conditions for existence – Transform of Elementary Functions – Basic Properties – Transform of Unit step function and Impulse function – Transform of Periodic function – Inverse Laplace Transform – Convolution Theorem (excluding Proof) – Initial and Final value Theorems – Solution of Linear ODE of Second order with constant coefficient using Laplace Transform techniques.													
<b>MODULE II</b>	<b>VECTOR CALCULUS</b>							<b>12 Hours</b>					
Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration: Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem (excluding proofs) – Applications of the above theorems to find surface area of a closed region and volume of cube and parallel piped.													
<b>MODULE III</b>	<b>ORDINARY DIFFERENTIAL EQUATIONS</b>							<b>12 Hours</b>					
Second order linear differential equations with variable coefficients, method of variation of parameters.													
<b>MODULE IV</b>	<b>COMPLEX VARIABLE – DIFFERENTIATION</b>							<b>12 Hours</b>					
Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; Conformal mappings, Mobius transformations.													
<b>MODULE V</b>	<b>COMPLEX VARIABLE– INTEGRATION</b>							<b>12 Hours</b>					
Contour integrals, Cauchy Integral formula (without proof), Taylor ‘s series, zeros of analytic functions, singularities, Laurent ‘s series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.													
<b>TOTAL: 60 HOURS</b>													
<b>COURSE OUTCOMES:</b>													
On the successful completion of the course, students will be able to													
<b>CO1:</b>	Apply Laplace transforms to solve physical problems arising in Engineering.												
<b>CO2:</b>	Solve engineering problems by using the concepts of gradient, divergence, and curl.												
<b>CO3:</b>	Solve the higher order differential equations using various techniques.												
<b>CO4:</b>	Make use of differentiation formulas to construct analytic functions related to complex variable.												
<b>CO5:</b>	Apply the concepts of integration for complex functions in certain regions to determine real integrals.												
<b>COs Vs POs MAPPING:</b>													
	<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	2	1										
<b>CO2</b>	3	2	1										
<b>CO3</b>	3	2	1										
<b>CO4</b>	3	2	1										
<b>CO5</b>	3	2	1										
<b>COs Vs PSOs MAPPING:</b>													
	<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>									
<b>CO1</b>	1												
<b>CO2</b>	1												
<b>CO3</b>	1												
<b>CO4</b>	1												
<b>CO5</b>	1												
<b>REFERENCES:</b>													
1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.													
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.													
3. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.													
4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.													
5. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill, 2004.													
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.													

1901CH203	MATERIALS CHEMISTRY				L	T	P	C				
					3	0	0	3				
<b>MODULE I</b>	<b>WATER TECHNOLOGY</b>							<b>9 Hours</b>				
Boiler -Boiler Types, boiler compounds - boiler troubles- Sources, hard & soft water-Degree of hardness and its estimation (EDTA method)- Water Quality Parameters. Boiler feed water-requirements - softening of hard water -external treatment –demineralization, Zeolite process internal treatment- desalination of sea water – reverse osmosis- Domestic water treatment.												
<b>MODULE II</b>	<b>THERMODYNAMICS</b>							<b>9 Hours</b>				
Thermodynamics -Introduction – terms, Entropy as a thermodynamic quantity, entropy changes in isothermal expansion of an ideal gas, reversible and irreversible processes, physical transformations, work & free energy functions, Helmholtz and Gibbs free energy functions, Gibbs – Helmholtz equation, Clapeyron-Clausius equation & its applications, Van't Hoff isotherm and applications.												
<b>MODULE III</b>	<b>CORROSION AND PROTECTIVE COATING</b>							<b>9 Hours</b>				
Corrosion And Protective Coating - Corrosion – types – chemical, electrochemical corrosion (galvanic, differential aeration) - Factors influencing corrosion -corrosion control – material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method. Protective coatings: Thermal Spray, electroplating of gold and electroless plating of nickel. Paints - Constituents and Functions. Estimation of iron.												
<b>MODULE IV</b>	<b>ALLOYS AND PHASE RULE</b>							<b>9 Hours</b>				
Alloys And Phase Rule -Introduction- Definition- properties of alloys- significance of alloying, functions and effect of alloying elements- Nichrome and stainless steel (18/8) – heat treatment of steel. Phase rule: Introduction, definition of terms with examples, one component system -water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system - Pattinson process.												
<b>MODULE V</b>	<b>FUELS AND ENGINEERING MATERIALS</b>							<b>9 Hours</b>				
Fuels And Engineering Materials-Fuel-Introduction- classification of fuels, carbonization- manufacture of metallurgical coke (Otto Hoffmann method)-Refining of petroleum- manufacture of synthetic petrol (Bergius process)- natural gas- compressed natural gas (CNG)- producer gas- water gas. Combustion-calorific value - Flue gas analysis (ORSAT Method). Fundamentals of nano chemistry, nano materials, synthesis, properties and application. Lubricants –types- application.												
<b>TOTAL: 45 HOURS</b>												
<b>COURSE OUTCOMES:</b>												
On the successful completion of the course, students will be able to												
<b>CO1:</b>	Describe the boiler troubles in terms of water quality.											
<b>CO2:</b>	Describe the principles thermodynamics to predict the feasibility of a reaction in thermal engineering.											
<b>CO3:</b>	Discuss the corrosion, its mechanism and preventive measures.											
<b>CO4:</b>	Describe the principles phase rule in alloys in manufacturing procedures.											
<b>CO5:</b>	Discuss the concept of combustion of fuels and its calorific value.											
<b>COs Vs POs MAPPING:</b>												
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	2	1										
<b>CO2</b>	2	1										
<b>CO3</b>	2	1										
<b>CO4</b>	2	1										
<b>CO5</b>	2	1										
<b>COs Vs PSOs MAPPING:</b>												
	<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>								
	<b>CO1</b>		1									
	<b>CO2</b>	1										
	<b>CO3</b>		1									
	<b>CO4</b>		1									
	<b>CO5</b>		1									

**REFERENCES:**

1. Dara S.S, Umare S.S, —Engineering Chemistry, S. Chand & Company Ltd., New Delhi 2010.
2. Sivasankar B., —Engineering Chemistry, Tata McGraw-Hill Publishing Company, Ltd., New delhi 2010
3. Jain and Jain, —Engineering Chemistry, Sixteenth edition, Dhanpatrai publications, 2012.
4. <https://www.ccdc.cam.ac.uk/solutions/csd-system/components/csd/>
5. [onlinelibrary.wiley.com/doi/10.1002/9780470661345.smc107/pdf](https://onlinelibrary.wiley.com/doi/10.1002/9780470661345.smc107/pdf)
6. <https://books.google.co.in/books?isbn=008053239X>

1901GEX03	PROGRAMMING FOR PROBLEM SOLVING				L	T	P	C				
					3	0	0	3				
<b>MODULE I</b>	<b>INTRODUCTION TO PROGRAMMING</b>							<b>9 Hours</b>				
Components of Computers and its Classifications – Generations of Computers – Number System – Problem Solving Techniques – Algorithm Design – Flowchart – Pseudocode – Algorithm to program, Compilation and Execution.												
<b>MODULE II</b>	<b>BASICS OF C PROGRAMMING</b>							<b>9 Hours</b>				
Structure of C program - C programming: Data Types – Storage classes - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Pre-processor directives												
<b>MODULE III</b>	<b>ARRAYS AND STRINGS</b>							<b>9 Hours</b>				
Introduction to Arrays: Declaration, Initialization – One dimensional array – Example Program: Computing Mean, Median and Mode - Two dimensional arrays – Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) - String operations: length, compare, concatenate, copy – Selection sort, linear and binary search.												
<b>MODULE IV</b>	<b>FUNCTIONS AND POINTERS</b>							<b>9 Hours</b>				
Introduction to functions: Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion – Example Program: Computation of Sine series, Scientific calculator using built-in functions, Binary Search using recursive functions – Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Example Program: Sorting of names – Parameter passing: Pass by value, Pass by reference – Example Program: Swapping of two numbers and changing the value of a variable using pass by reference												
<b>MODULE V</b>	<b>STRUCTURES &amp; FILE PROCESSING</b>							<b>9 Hours</b>				
Structure - Nested structures – Pointer and Structures – Array of structures – Example Program using structures and pointers – Dynamic memory allocation - Singly linked list -Files – Types of file processing: Sequential access, Random access – Sequential access file - Example Program: Finding average of numbers stored in sequential access file - Random access file - Example Program: Transaction processing using random access files – Command line arguments.												
								<b>TOTAL: 45 HOURS</b>				
<b>COURSE OUTCOMES:</b>												
On the successful completion of the course, students will be able to												
<b>CO1:</b>	Formulate Simple algorithms for arithmetic and logical Problems.											
<b>CO2:</b>	Translate algorithms to Programs.											
<b>CO3:</b>	Implement conditional branching, iteration and recursion.											
<b>CO4:</b>	Use arrays, Structures, to formulate algorithms and programs.											
<b>CO5:</b>	Use Pointers and Files for solving problems.											
<b>COs Vs POs MAPPING:</b>												
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	2	2						1			
<b>CO2</b>	2	2	1						2			2
<b>CO3</b>	1		1									
<b>CO4</b>	1		1									
<b>CO5</b>	1		1									
<b>COs Vs PSOs MAPPING:</b>												
	<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>								
	<b>CO1</b>			2								
	<b>CO2</b>			2								
	<b>CO3</b>			2								
	<b>CO4</b>			2								
	<b>CO5</b>			2								

**REFERENCES:**

1. Paul Deitel and Harvey Deitel, —C How to Program, Seventh edition, Pearson Publication.
2. Juneja, B. L and Anita Seth, —Programming in C, CENGAGE Learning India pvt. Ltd., 2011.
3. Pradip Dey, Manas Ghosh, —Fundamentals of Computing and Programming in C, First Edition, Oxford University Press, 2009.
4. Anita Goel and Ajay Mittal, —Computer Fundamentals and Programming in C, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw Hill Education, 1996.

1901ENX01	ENGLISH FOR ENGINEEERS				L	T	P	C				
					2	0	0	2				
<b>MODULE I</b>	<b>FOCUS ON LANGUAGE (Vocabulary and Grammar)</b>						<b>6 Hours</b>					
Vocabulary -The Concept of Word Formation - prefixes- suffixes- Synonyms - Antonyms. Grammar - Articles – Preposition – Adjective – Adverb – connectives – Tenses (present, past & future) – Impersonal passive voice - Wh- Questions.												
<b>MODULE II</b>	<b>LISTENING SKILLS</b>						<b>6 Hours</b>					
Listening – listening intently-arousing and sustaining interest-listening to short or longer texts – formal and informal conversations – telephonic etiquettes – narratives from different sources – listening and note taking – correlative verbal and non-verbal communication – listening to TOEFL & IELTS programs.												
<b>MODULE III</b>	<b>SPEAKING SKILLS</b>						<b>6 Hours</b>					
Speaking – stress and intonation – persuasive speaking – Describing person, place and thing - sharing personal information - greetings – taking leave – Individual and Group Presentation - impromptu presentation – public speaking-Group Discussion.												
<b>MODULE IV</b>	<b>READING SKILLS</b>						<b>6 Hours</b>					
Reading – comprehending general and technical articles - cloze reading - inductive reading - short narratives and descriptions from newspapers – Skimming and scanning-reading and interpretation-critical reading-interpreting and transferring graphical information- sequencing of sentences.												
<b>MODULE V</b>	<b>WRITING SKILLS</b>						<b>6 Hours</b>					
Writing- Precise writing – Summarizing – interpreting visual texts (pie chart, bar chart, picture, advertisements etc., - Proposal writing – report writing – job application – e-mail drafting – letter writing (permission, accepting and decaling) – Instructions – recommendations – checklist.												
<b>TOTAL: 30 HOURS</b>												
<b>COURSE OUTCOMES:</b>												
On the successful completion of the course, students will be able to												
<b>CO1:</b>	Interpret grammatically correct sentences for oral as well as written communication.											
<b>CO2:</b>	Identify perfectly after paying attention to an audio on any theme.											
<b>CO3:</b>	Demonstrate formal presentations effectively.											
<b>CO4:</b>	Explain the content of any written or visual material.											
<b>CO5:</b>	Describe technical and non-technical documents with appropriate contents and context.											
<b>COs Vs POs MAPPING:</b>												
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>										3		
<b>CO2</b>										3		
<b>CO3</b>										3		
<b>CO4</b>										3		
<b>CO5</b>										3		
<b>COs Vs PSOs MAPPING:</b>												
	<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>								
	<b>CO1</b>											
	<b>CO2</b>											
	<b>CO3</b>											
	<b>CO4</b>											
	<b>CO5</b>											
<b>REFERENCES:</b>												
1. Raman, Meenakshi and Sangeetha Sharma. (2011). Technical Communication: Principles and Practice. New Delhi: Oxford University Press.												
2. Rizvi and Ashraf M. (2005). Effective Technical Communication. New Delhi: Tata McGraw- Hill.												

3. G. Radhakrishna Pillai. English for Success - Central Institute of English and Foreign Languages, Hyderabad: Emerald Publishers.
4. Jones, D. (2002). The Pronunciation of English. Cambridge: CUP; rpt in facsimile in Jones.
5. English for Engineers - Regional Institute of English (2006). New Delhi: Cambridge University Press.
6. Rutherford and Andrea. (2001). Basic Communication Skills for Technology. New Delhi: Pearson.
7. Viswamohan A. (2008). English for Technical Communication. New Delhi: Tata McGraw-Hill.



1901GE201	ENGINEERING EXPLORATION	L	T	P	C
		0	0	4	2
<b>HOW TO PURSUE THE PROJECT WORK?</b>					
<ul style="list-style-type: none"> <li>The first part will be learning-based-masking students to embrace the methodology by exploring all the phases of design thinking through the wallet/ bag challenge and podcasts.</li> <li>The second part will be more discussion-based and will focus on building some necessary skills as designers and learning about complementary material for human- centered design.</li> <li>The class will then divide into teams and they will be working with one another for about 2 – 3 weeks. These teams and design challenges will be the basis for the final project and final presentation to be presented.</li> <li>The teams start with <b>Design Challenge</b> and go through all the phases more in depth from coming up with the right question to empathizing to ideating to prototyping and to testing.</li> <li>Outside of class, students will also be gathering the requirements, identifying the challenges, usability, importance etc</li> <li>At the end, Students are required to submit the final reports, and will be evaluated by the faculty.</li> </ul>					
<b>TASKS TO BE DONE:</b>					
<p><b>Task 1: Everyone is a Designer</b></p> <ul style="list-style-type: none"> <li>Understand class objectives &amp; harness the designer mindset</li> </ul> <p><b>Task 2: The Wallet/Bag Challenge and Podcast</b></p> <ul style="list-style-type: none"> <li>Gain a quick introduction to the design thinking methodology</li> <li>Go through all stages of the methodology through a simple design challenge</li> <li>Podcast: Observe, Listen and Engage with the surrounding environment and identify a design challenge.</li> </ul> <p><b>Task 3: Teams &amp; Problems</b></p> <ul style="list-style-type: none"> <li>Start Design Challenge and learn about teams &amp; problems through this</li> <li>Foster team collaboration, find inspiration from the environment and learn how to identify problems</li> </ul> <p><b>Task 4: Empathizing</b></p> <ul style="list-style-type: none"> <li>Continue Design Challenge and learn empathy</li> <li>Learn techniques on how to empathize with users</li> <li>Go to the field and interview people in their environments</li> <li>Submit Activity Card</li> </ul> <p><b>Task 5: Ideating</b></p> <ul style="list-style-type: none"> <li>Continue Design Challenge and learn how to brainstorm effectively</li> <li>Encourage exploration and foster spaces for brainstorming</li> <li>Submit Activity Card</li> </ul> <p><b>Task 6: Prototyping</b></p> <ul style="list-style-type: none"> <li>Continue Design Challenge and learn how to create effective prototypes</li> <li>Build tangible models and use them as communication tools</li> <li>Start giving constructive feedback to classmates and teammates</li> <li>Submit Activity Card</li> </ul> <p><b>Task 7: Testing</b></p> <ul style="list-style-type: none"> <li>Finish Design Challenge and iterate prototypes and ideas through user feedback</li> <li>Evolve ideas and prototypes through user feedback and constructive criticism</li> <li>Get peer feedback on individual and group performance</li> <li>Submit Activity Card</li> </ul> <p><b>Task 8:</b></p> <ul style="list-style-type: none"> <li>Final Report Submission and Presentation</li> </ul> <p><b>Method of Evaluation: Same as Mini project category. Project exhibition may be conducted.</b></p>					
					<b>TOTAL: 45 HOURS</b>
<b>COURSE OUTCOMES:</b>					
On the successful completion of the course, students will be able to					
<b>CO1:</b>	Describe class objectives & harness the designer mindset.				
<b>CO2:</b>	Describe the design thinking methodology.				
<b>CO3:</b>	Demonstrate about teams & problems through this,				

<b>CO4:</b>	Demonstrate about empathy.
<b>CO5:</b>	Demonstrate about how to brainstorm effectively.
<b>CO6:</b>	Design and fabricate effective prototypes
<b>CO7:</b>	Inspect prototypes and ideas through user feedback
<b>CO8:</b>	Prepare final Report and Presentation

**COs Vs POs MAPPING:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	2	3				2			3	3		2
<b>CO2</b>	2	3				2			3	3		2
<b>CO3</b>	2	3				2			3	3		2
<b>CO4</b>	2	3				2			3	3		2
<b>CO5</b>	2	3				2			3	3		2
<b>CO6</b>	3	3	2		2	2			3	3		2
<b>CO7</b>	3	3	3		2	2			3	3		2
<b>CO8</b>	2	3			1	2			3	3		2

**COs Vs PSOs MAPPING:**

COs	PSO1	PSO2	PSO3
<b>CO1</b>			2
<b>CO2</b>			2
<b>CO3</b>			2
<b>CO4</b>			2
<b>CO5</b>			2
<b>CO6</b>			2
<b>CO7</b>			2
<b>CO8</b>			2

**REFERENCES:**

1. Tom Kelly, The Art of Innovation: Lessons in Creativity From IDEO, America’s Leading Design Firm (Profile Books, 2002)
2. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation (Harper Business, 2009)
3. Jeanne Liedtka, Randy Salzman, and Daisy Azer, Design Thinking for the Greater Good: Innovation in the Social Sector (Columbia Business School Publishing, 2017)

**OTHER USEFUL DESIGN THINKING FRAMEWORKS AND METHODOLOGIES:**

1. Human-Centered Design Toolkit (IDEO); <https://www.ideo.com/post/design-kit>
2. Design Thinking Boot Camp Bootleg (Stanford D-School); <https://dschool.stanford.edu/resources/the-bootcamp-bootleg>
3. Collective Action Toolkit (frogdesign); [https://www.frogdesign.com/wpcontent/uploads/2016/03/CAT\\_2.0\\_English.pdf](https://www.frogdesign.com/wpcontent/uploads/2016/03/CAT_2.0_English.pdf)
4. Design Thinking for Educators (IDEO); <https://designthinkingforeducators.com/>

1901CHX51	ENGINEERING CHEMISTRY LAB	L	T	P	C
		0	0	2	1

**List of Experiments:**

1. Determination of total, temporary & permanent hardness of water by EDTA method
2. Determination of strength of given hydrochloric acid using pH meter
3. Estimation of iron content of the given solution using potentiometer
4. Estimation of sodium present in water using flame photometer
5. Corrosion experiment – weight loss method
6. Determination of molecular weight of a polymer by viscometer method
7. Conductometric titration of strong acid Vs strong Base
8. Estimation of dissolved oxygen in a water sample/sewage by Winkler's method
9. Comparison of alkalinities of the given water samples
10. Determination of concentration of unknown colored solution using spectrophotometer
11. Determination of percentage of copper in alloy
12. Determination of ferrous iron in cement by spectrophotometry method
13. Adsorption of acetic acid on charcoal
14. Determination the flash point and fire point of a given oil using pen skyMartine closed cup apparatus
15. Determination the calorific value of solid fuels
16. Determination the structural of the compound using chemo software.

**TOTAL: 30 HOURS**

**COURSE OUTCOMES:**

On the successful completion of the course, students will be able to

- CO1:** Measure the hardness and alkalinity of given water sample
- CO2:** Find the amount and percentage of iron in unknown sample using EMF and photometric methods.
- CO3:** Determine the amount of strong acid present in the given sample using PH metric and conductometric methods.
- CO4:** Determine the amount of dissolved oxygen and heavy metal present in the given sample.
- CO5:** Determine the molecular weight of the given polymer.

**COs Vs POs MAPPING:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3			1			3	3			
CO2	3	3			1			3	3			
CO3	3	3			1			3	3			
CO4	3	3			1			3	3			
CO5	3	3			1			3	3			

**COs Vs PSOs MAPPING:**

COs	PSO1	PSO2	PSO3
CO1	1		
CO2			
CO3			
CO4			
CO5			

**REFERENCES:**

1. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., —Vogel's Textbook of practical organic chemistry, LBS Singapore (1994).
2. Jeffery G.H., Bassett J., Mendham J.and Denny vogel's R.C, —Text book of quantitative analysis chemical analysis, ELBS 5th Edn. Longman, Singapore publishers, Singapore, 1996.
3. aniel R. Palleros, —Experimental organic chemis ry, John Wiley & Sons, Inc., New Yor (2001).
4. Kolthoff I.M., Sandell E.B. et al. —Quantitative chemical analysis, Mcmillan, Madras 1980.

1901GEX52	COMPUTER PROGRAMMING LAB	L	T	P	C
		0	0	2	1

**List of Experiments:**

1. Working with word and style sheets
2. Write a C program to implement basic concepts
3. Write a C program to implement Decision Making and Branching statements
4. Write a C program to implement looping statements
5. Write a C program to implement Arrays
6. Write a C program to implement Strings
7. Write a C program to implement pointers
8. Write a C program to implement Structures
9. Write a C program to work with files in C

**TOTAL: 30 HOURS**

**COURSE OUTCOMES:**

On the successful completion of the course, students will be able to

**CO1:** Comprehend perfectly after paying attention to an audio on any theme.

**CO2:** Express the content of any written or visual material.

**CO3:** Prepare technical and non-technical documents with appropriate contents and context.

**CO4:** Manipulate, analyse and adjust their own communication.

**CO5:** Apply soft skills during presentation, interview, and Group Discussion.

**CO6:** Show consistent accent and intelligibility in their pronunciation.

**COs Vs POs MAPPING:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										3		
CO2										3		
CO3										3		
CO4										3		
CO5										3		
CO6										3		

**COs Vs PSOs MAPPING:**

COs	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			
CO5			
CO6			

**REFERENCES:**

1. Paul Deitel and Harvey Deitel, —C How to Program, Seventh edition, Pearson Publication.
2. Juneja, B. L and Anita Seth, —Programming in C, CENGAGE Learning India pvt. Ltd., 2011.
3. Pradip Dey, Manas Ghosh, —Fundamentals of Computing and Programming in C, First Edition, Oxford University Press, 2009.
4. Anita Goel and Ajay Mittal, —Computer Fundamentals and Programming in C, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw Hill Education, 1996.

1901HSX51	COMMUNICATION SKILLS LAB	L	T	P	C
		0	0	2	1

**List of Experiments:**

**1. Activities on Fundamentals of Inter-personal Communication**

Starting a conversation - responding appropriately and relevantly - using the right body language - Role Play in different situations & Discourse Skills- using visuals.

**2. Activities on Reading Comprehension**

General Vs Local comprehension- reading for facts- guessing meanings from context-Scanning-skimming and inferring meaning- critical reading & effective googling.

**3. Activities on Writing Skills**

Structure and presentation of different types of writing - letter writing/ Resume writing/e- correspondence/ Proposal writing/Technical report writing/ Portfolio writing - planning for writing - improving one's writing.

**4. Activities on Presentation Skills**

Oral presentations (individual and group) through JAM sessions / seminars / PPTs and written presentations through posters/ projects/ reports/ e-mails/ assignments etc.- creative and critical thinking.

**5. Activities on Soft Skills**

Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation-Concept and process, pre- interview planning, opening strategies, answering strategies, interview through tele-conference & video-conferencing and Mock Interviews-Time management-stress management –paralinguistic features- Multiple intelligences – emotional intelligence – spiritual quotient (ethics) – intercultural communication – creative and critical.

**TOTAL: 45 HOURS**

**COURSE OUTCOMES:**

On the successful completion of the course, students will be able to

**CO1:** Comprehend perfectly after paying attention to an audio on any theme.

**CO2:** Express the content of any written or visual material.

**CO3:** Prepare technical and non-technical documents with appropriate contents and context.

**CO4:** Manipulate, analyse and adjust their own communication.

**CO5:** Apply soft skills during presentation, interview, and Group Discussion.

**COs Vs POs MAPPING:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2									3			3
CO3									3			3
CO4												3
CO5										3		

**COs Vs PSOs MAPPING:**

COs	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			
CO5			

**REFERENCES:**

1. Raman, Meenakshi and Sangeetha Sharma, "Technical Communication: Principles and Practice", Oxford University Press, New Delhi, 2011.
2. Sudha Rani, D, "Advanced Communication Skills Laboratory Manual", Pearson Education 2011.
3. Paul V. Anderson, "Technical Communication", Cengage Learning pvt. Ltd. New Delhi, 2007.
4. "English Vocabulary in Use series", Cambridge University Press 2008.
5. "Management Shapers Series", Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
6. Rizvi and Ashraf M., "Effective Technical Communication", Tata McGrawHill, New Delhi, 2005.
7. Jones, D, "The Pronunciation of English", CUP, Cambridge, 2002.

<b>1901GE252</b>	<b>ENGINEERING INTELLIGENCE II</b>						<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>		
						<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>			
<b>MODULE I</b>	<b>VOCABULARY BUILDING</b>							<b>6 Hours</b>				
Parts of Grammar- SVA- Art of Writing- word building activities.												
<b>MODULE II</b>	<b>COMMUNICATION WORKSHOP</b>							<b>6 Hours</b>				
Story Telling- Newspaper Reading-Extempore.												
<b>MODULE III</b>	<b>INTERPERSONAL SKILLS</b>							<b>6 Hours</b>				
Personality Development - Creativity and innovation –Critical Thinking and Problem Solving – Work Ethics-Technical Skill Vs Interpersonal Skills												
<b>MODULE IV</b>	<b>LEADERSHIP &amp; EMPLOYABILITY SKILLS</b>							<b>6 Hours</b>				
Levels of Leadership-Making of a leader-Type of leadership-Transactions Vs Transformational Leadership –Exercises - Industry Expectations & Career Opportunities- Recruitment patterns.												
<b>MODULE V</b>	<b>RESUME BUILDING</b>							<b>6 Hours</b>				
Importance of Resume- Resume Preparation - introducing oneself												
<b>TOTAL: 30 HOURS</b>												
<b>COURSE OUTCOMES:</b>												
On the successful completion of the course, students will be able to												
<b>CO1:</b>	Understand various vocabulary building activities.											
<b>CO2:</b>	Use various communication skill workshop for reading and writing.											
<b>CO3:</b>	Apply interpersonal skill to motivate creating and innovating skills.											
<b>CO4:</b>	Apply various leadership and employability skill to get career opportunities.											
<b>CO5:</b>	Prepare resume with necessary components.											
<b>COs Vs POs MAPPING:</b>												
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>										3		
<b>CO2</b>										3		
<b>CO3</b>												3
<b>CO4</b>									3			
<b>CO5</b>												3
<b>COs Vs PSOs MAPPING:</b>												
	<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>								
	<b>CO1</b>											
	<b>CO2</b>											
	<b>CO3</b>											
	<b>CO4</b>											
	<b>CO5</b>											
<b>REFERENCES:</b>												
1. Barun K. Mitra; (2011), “Personality Development & Soft Skills”, First Edition; Oxford Publishers.												
2. Raymond Murphy, Essential English Grammar in Use, Cambridge University press, New Delhi, Third Edition , 2007												
3. Arun Sharma and Meenakshi Upadhyav, How to Prepare for Verbal Ability and Reading Comprehension for CAT, McGrawHill Publication, Seventh Edition 2017												