

E.G.S.PILLA YENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai
Accredited by NAAC with „A“ Grade | Accredited by NBA (CSE, EEE, MECH,
ECE, CIVIL, IT)

NAGAPATTINAM-611002



B.E. Biomedical Engineering

Full Time Curriculum and Syllabus

First Year – First Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1901MA104	Engineering Mathematics –I (Linear Algebra, Calculus and Partial differentiation)	3	1	0	4	40	60	100
1901CH103	Chemistry for Biomedical Engineering	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	100	-	100
Laboratory Course								
1901GEX52	Computer Programming Lab	0	0	2	1	50	50	100
1901GEX51	Engineering Intelligence I	0	0	2	1	50	50	100
1901CHX51	Engineering Chemistry Lab	0	0	2	1	50	50	100
1901HSX51	Communication Skills	0	0	2	1	100	0	100
Total		11	1	8	16	470	330	800

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

1901MA104	Engineering Mathematics –I (Linear Algebra, Calculus and Partial differentiation) (ECE,MECH & BME)	L	T	P	C
		3	1	0	4
<p>Aim of the course:</p> <ul style="list-style-type: none"> To develop the use of matrix algebra techniques that is needed by engineers for practical applications. To familiarize the students with differential calculus. To familiarize the student with functions of several variables. This is needed in many branches of engineering. To make the students understand various techniques of integration. To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications. 					
<p>PREREQUISITES: BASIC MATHEMATICS</p>					
<p>Module 1: Matrices-Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric,skew-symmetric and orthogonal matrices; Determinants; Eigen values and Eigen vectors;Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.</p> <p>Module 2:Differential Calculus - Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature- Evolutes and involutes.</p> <p>Module 3: Integral Calculus - Double integration – Cartesian and polar coordinates – Change the order of Integration – Applications: Area of a curved surface using double integral – Triple integration in Cartesian co-ordinates – Volume as triple integral.</p> <p>Module 3: Sequences and series- Convergence of sequence and series, tests for convergence; Power series, Taylor's series, Series for exponential, trigonometric and logarithm functions.</p> <p>Module 5: Partial Differentiation: Partial derivatives, total derivative; Maxima, minima and saddle points; Method of Lagrange multipliers.</p>					
<p>COURSE OUTCOMES</p> <p>After completion of the course, the student will be able to</p> <p>CO1:Calculate the nature of the matrix using Orthogonal Transformation.</p> <p>CO2:Develop the evolutes and envelopes of given curves by means of radius and centre of curvature.</p> <p>CO3:Calculate the area and volume of a curve using double and triple integration.</p> <p>CO4: Determine the nature of series using comparison, Ratio, Leibnitz tests.</p> <p>CO5:Examine the maxima/minima for the given function with several variables by finding stationary points.</p>					
<p>TEXT BOOKS:</p>					
<p>REFERENCES (BOOKS):</p> <ol style="list-style-type: none"> 1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2018. 2.G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002. 3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006. 4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010. 5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005. 6.N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008. 7.B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010. 					

1901CH103	CHEMISTRY FOR BIOMEDICAL ENGINEERING	L	T	P	C
		3	0	0	3
Aim of the course: Imparting knowledge on the principles of nanotechnology, Drug delivery systems, materials for medicine, tissue engineering material and metals in biological system with their applications.					
PREREQUISITES: BASIC CHEMISTRY					
MODULE-I: BASICS OF NANO CHEMISTRY Nano technology Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. : nano cluster, nano rod, nanotube (CNT) and nanowire. Synthesis: precipitation, thermolysis, hydrothermal, solvothermal, electro deposition, chemical vapor deposition, laser ablation; Properties and applications.					
MODULE-II: DRUG DELIVERY SYSTEMS Drug Delivery Systems -Some examples of drug carriers – cyclodextrin- MOF- Pharmaceutical Cocrystals. Fundamentals of Drug Nanoparticles: Delivery of Nanoparticles: Brain Delivery, Ocular Drug Delivery, Gene Delivery Systems, Carriers in Cancer Therapy, Cardiovascular System, Vascular Delivery to the Lungs, Targeting Lymphatics.					
MODULE-III: MATERIALS FOR MEDICINE <u>Materials for Medicine</u> - General requirements of biomaterials- Polymer biomaterials, <u>Elastomers</u> , Thermoplastics, Thermosets, Applications of biomaterials - <u>Cardiovascular devices</u> - <u>Orthopedic devices</u> .					
MODULE-IV: MATERIALS FOR TISSUE ENGINEERING Tissue engineering materials- <i>Introduction to biomaterials</i> - <i>Natural materials</i> -ECM (Collagen, elastin, glycoproteins, glycosaminoglycans, proteoglycans, Crosslinked collagen patch synthetic materials,-Expanded polytetrafluoroethylene -Polyethylene terephthalate-Polyurethane. Organic inorganic Hybrid materials used in tissue engineering. Metals for tissue engineering-Titanium, stainless steel, nitinol, cobalt–chromium and platinum–chromium.					
MODULE-V: METALS IN BIOLOGY Metals in biology- Iron system- heme and non-heme oxygen carriers, haemoglobin and myoglobin-Cooperativity, Hill coefficient, oxy and deoxy haemoglobin, reversible binding of oxygen, Perutz model. Iron storage system ferritin system.					
COURSE OUTCOMES After completion of the course , the students will be able to CO1: Differentiate nanoparticles, bulk materials, atoms and molecules CO2: Identify the suitable drug carriers for drug delivery CO3: Understand the quality of biomaterials as medicine CO4: Gain knowledge about alloys and polymers in tissue engineering CO5: Know the role of metals in biological components					
REFERENCES (BOOKS):					
1.Dara S.S, Umare S.S, -Engineering Chemistryll, S. Chand & Company Ltd., New Delhi 2010. 2.Sivasankar B., -Engineering Chemistryll, Tata McGraw-Hill Publishing Company, Ltd., New delhi 2010 3.Gowariker V.R., Viswanathan N.V. and Jayadev Sreedhar, -Polymer Sciencell, New Age 4.Ozin G. A. and Arsenault A. C., -Nanochemistry: A Chemical Approach to					

Nanomaterials, RSC Publishing, 2005

5. Text book of bioinorganic chemistry, R. K Sharma Delhi.

6. Modern Inorganic Chemistry By James E Huheey 2. Inorganic Chemistry By D F Shriver and P W Atkins 1.

7. Nanoparticle Technology for Drug Delivery. Edited by Ram B. Gupta, Uday B. Kompella, 2006, Taylor & Francis Group, 270 Madison Avenue, New York, NY 10016.

8. Tissue Engineering, Clemens van Blitterswijk, Peter Thomsen, Anders Lindahl, Jeffrey Hubbell, David Williams, Ranieri Cancedda, Joost de Bruijn, Jérôme Sohier, Academic Press, Elsevier, 84 Theobald's Road, London WC1X 8RR, UK, 30 Corporate Drive, Suite 400, Burlington, MA 01803, USA, 525 B Street, Suite 1900, San Diego, CA 92101-4495, USA, 2008 ISBN: 978-0-12-370869-4.

REFERENCES (WEBSITES):

1. <https://www.ccdc.cam.ac.uk/solutions/csd-system/components/csd/>

2. onlinelibrary.wiley.com/doi/10.1002/9780470661345.smc107/pdf

1901GEX03	PROGRAMMING FOR PROBLEM SOLVING (Common for all B.E./B.Tech Programme)	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
1.To prepare students to comprehend the fundamental concepts 2.To demonstrate fine grained operations in number system 3.To gain exposure in programming language using C 4.To develop programming skills using the fundamentals and basics of C Language					
MODULE I	INTRODUCTION TO PROGRAMMING	9 Hours			
Components of Computers and its Classifications- Problem Solving Techniques – Algorithm- Flowchart– Pseudo code – Program-Compilation -Execution					
MODULE II	BASICS OF C PROGRAMMING	9 Hours			
Structure of C program - C programming: Data Types – Storage classes - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/output statements – Decision making statements - Switch statement - Looping statements – Pre-processor directives.					
MODULE III	ARRAYS AND STRINGS	9 Hours			
Introduction to Arrays: Declaration, Initialization – One dimensional array – Two dimensional arrays – Example Program: Matrix Operations - String operations					
MODULE IV	FUNCTIONS AND POINTERS	9 Hours			
Introduction to functions: Function prototype, function definition, function call, Built-in functions – Recursion – Example Program – 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					
MODULE V	STRUCTURES & FILE PROCESSING	9 Hours			
Structure - Nested structures – Pointer and Structures – Array of structures – Example Program using structures and pointers – Dynamic memory allocation -Files – Types - File processing: Sequential access, Random access -Command line arguments					
TOTAL: 45 HOURS					
FURTHER READING: Object Oriented Programming Approach.					
COURSE OUTCOMES: On the successful completion of the course, students will be able to CO1: Describe basic concepts of computers CO2: Paraphrase the operations of number system CO3: Describe about basic concepts of C-Language CO4: Understand the code reusability with the help of user defined functions CO5: Analyze the structure concept, union, file management and preprocessor in C language					
REFERENCES:					
1. Paul Deitel and Harvey Deitel, —C How to ProgramI, Seventh edition, Pearson Publication					
2. Juneja, B. L and Anita Seth, —Programming in Cl, CENGAGE Learning India pvt. Ltd., 2011					
3. Pradip Dey, Manas Ghosh, —Fundamentals of Computing and Programming in Cl, First Edition, Oxford University Press, 2009.					
4. Anita Goel and Ajay Mittal, —Computer Fundamentals and Programming in Cl, 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 ENGINEERS	L	T	P	C
	(Common for all B.E./B.Tech. Programme)	3	0	0	3

MODULE I FOCUS ON LANGUAGE (Vocabulary and Grammar) 9 Hours

Vocabulary -The Concept of Word Formation - Prefixes- Suffixes- Synonyms – Antonyms - Grammar - Articles- Preposition- Adjective-Adverb-Connectives -Tenses (present, past & future) - Conditional Clauses - Active voice –passive voice and Impersonal passive voice - Wh- Questions.

MODULE II LISTENING SKILLS 9 Hours

Listening-Types of Listening -listening to short or longer texts- listening and Note taking- -formal and informal conversations- telephonic etiquettes- narratives from different sources. - Correlative verbal and nonverbal communication - listening to panel members (how to response to panel members after listening panel members) – listening to facing online interviews (or) interviews on video conferencing mode - listening webinars.

MODULE III SPEAKING SKILL 9 Hours

Speaking - Stress and intonation –Communication skills- Role of ICT in Communication, -Process of communication- oral presentation skills- verbal and non verbal communication-individual and group presentations- impromptu presentation- public speaking- Group discussion- speaking to the panel members (online interviews , video conferencing, online meeting and webinars.

MODULE IV READING SKILLS 9 Hours

Reading– Intensive Reading –Predicting the content -Comprehending general and technical articles -Cloze reading - Inductive reading- Short narrative and descriptions from newspapers – Skimming and scanning-reading and interpretation-critical reading interpreting and transferring graphical information- sequencing of sentences- analytical reading on various Projects.

MODULE V WRITING SKILLS 9 Hours

Writing- Precise writing –Summarizing- Interpreting visual texts (pie chart, bar chart, picture, advertisements etc., - Proposal writing (launching new units or department in a institution or industry & to get loan from bank) -Report writing (accident, progress, project, survey, Industrial visit)- job application- e- mail drafting- letter writing (permission, accepting and decaling)- e.mail drafting instructions – recommendations –checklist- uses of Print and electronic media (internet, fax, mobile, interactive video and teleconferencing, computer) e-governance.

TOTAL: 45 HOURS

REFERENCES:

1. Raman, Meenakshi and Sangeetha Sharma, “Technical Communication: Principles and Practice”, Oxford University Press, New Delhi, 2011.
2. Rizvi and Ashraf M., “Effective Technical Communication”, Tata McGraw-Hill, New Delhi, 2005.
3. G. Radhakrishna Pillai, “English for Success”, Central Institute of English and Foreign Languages”, Emerald Publishers ,Hyderabad, 2003
4. Jones, D, “The Pronunciation of English”, CUP, . Cambridge,2002.

1901GEX52

COMPUTER PROGRAMMING LAB

L T P C
0 0 2 1

(Common for all B.E./B.Tech. Programme)

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

References

Total: 45 Hours

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.

1901GE151	ENGINEERING INTELLIGENCE I (Common for all B.E./B.Tech. Programme)	L	T	P	C
		0	0	2	1
MODULE I	BEHAVIORAL CHANGES–TRANSITION OF SCHOOL TO COLLEGE				6 Hours
Vocabulary -The Concept of Word Formation - prefixes- suffixes- Synonyms – Antonyms - Grammar - Articles-Preposition- Adjective-Adverb-connectives -Tenses (present, past & future) - Sentence pattern-types of sentences -Active voice –passive voice and Impersonal passive voice - Wh- Questions.					
MODULE II	EXPOSURE TO INDIVIDUAL COMPETANCE				6 Hours
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 nonverbal communication-listening to TOEFL & IELTS programs-listening to Project presentation- listening to technical seminar and conferences.					
MODULE III	CAREER PLANNING				6 Hours
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- project planning-facing viva voce and delivering project.					
MODULE IV	INTRODUCTION TO COMMUNICATION SKILLS				6 Hours
Reading– comprehending general and technical articles -cloze reading - inductive reading- short narrative and descriptions from newspapers – Skimming and scanning-reading and interpretation-critical reading interpreting and transferring graphical information- sequencing of sentences-analytical reading on various Projects.					
MODULE V	COMMUNICATION EXERCISE-1				6 Hours
Writing- Precise writing –Summarizing- interpreting visual texts (pie chart, bar chart, picture - advertisements etc., - Proposal writing (launching new units or department in a institution or industry & to get loan from bank) -report writing (accident, progress, project, survey, Industrial visit)- job application- e-mail drafting- letter writing (permission, accepting and decaling)-instructions – recommendations –checklist					
TOTAL: 30 HOURS					
Course Outcomes: At the end of the course, students will be able to CO1: Apply their knowledge and skill to engineering field CO2: Understand the value of individual competence CO3: Apply their skill to career planning and team work CO4: Illustrate verbal and non verbal skills CO5: Use various communication skill exercise to write and interpret the contents					
REFERENCES:					
1. Dr.P.Prasad(2012) –The Functional Aspects of COMMUNICATION SKILLS ;fifth Edition;S.K Kataria & Sons Publication					
2. Kalyana; (2015) —Soft Skill for Managers ; First Edition; Wiley Publishing Ltd.					
3. Aruna Koneru (2008) —Professional Communication ; Second edition; Tata McGraw-Hill Publishing Ltd.					

1901CHX51	ENGINEERING CHEMISTRY LAB	L	T	P	C
		0	0	2	1
<p>Aim of the course: Engineering Chemistry laboratory course is designed to provide basic chemistry and its application to the first year engineering students. The course includes the study of applications of water quality chemistry, identification of acidic and alkaline nature of water, molecular weight determination and explaining the principles behind each experiments.</p>					
<p>List of Practical Experiments</p> <ol style="list-style-type: none"> 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 viscometry method 7. Conductometric titration of strong acid Vs strong Base 8. Estimation of dissolved oxygen in a water sample/sewage by Winklers 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 Pensky martine closed cup apparatus 15. Determination the calorific value of solid fuels 16. Determination the structural of the compound using chemo software. 					
<p>COURSE OUTCOMES</p> <p>After completion of the course, the student will be able to</p> <p>CO1: Measure the hardness and alkalinity of given water sample</p> <p>CO2: Find the amount and percentage of iron in unknown sample using EMF and photometric methods</p> <p>CO3: Determine the amount of strong acid present in the given sample using PH metric and conductometric methods</p> <p>CO4: Determine the amount of dissolved oxygen and heavy metal present in the given sample</p> <p>CO5: Determine the molecular weight of the given polymer</p>					
<p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 1. Experimental organic chemistry, Daniel R. Palleros, John Wiley & Sons, Inc., New Yor (2001) 2. —Engineering Chemistryll, Jain & Jain, 15th edition, Dhanpat Rai Publishing company, New Delhi. 3. Vogel’s Textbook of practical organic chemistry, Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R LBS Singapore (1994). 4. LBS Singapore (1994). Kolthoff I.M., Sandell E.B. et al Mcmillan, Madras 1980. 					

1901HSX51

COMMUNICATION SKILLS LAB	L	T	P	C
(Common to all B.E./B.Tech. Programme)	0	0	2	1

List of Experiments:

- 1. Activities on Fundamentals of Listening and Inter-personal Communication (6)**
Listening to conversation, listening to technical presentation- listening to online video conferencing ,interviews and webinars -starting a conversation - responding appropriately and relevantly - using appropriate body language - Role Play in different situations & Discourse Skills- using visuals.
- 2. Activities on Reading Comprehension (6)**
General Vs Local comprehension- reading for facts- guessing meanings from context- Scanning- skimming and inferring meaning- critical reading & effective googling- TOFEL,IELTS-reading online journals.
- 3. Activities on Writing Skills (6)**
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 (6)**
Oral presentations (individual and group) through JAM sessions – presentation on online platform (webinars, online meeting) - seminars -PPTs and written presentations through posters- projects- report- e-mails- assignments etc.- creative and critical thinking.
- 5. Activities on Soft Skills (6)**
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: 30 Hours

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.

