Title	Course Structure			Pre-Requisite
MC102: Complex Analysis	L	T	P	NIL
	3	1	0	

Course Objective: To acquaint the students with the knowledge of complex variables, contour integration, conformal mappings.

S. NO	Course Outcomes (CO)
CO1	Explain techniques of complex analysis in a comprehensible manner.
CO2	Identify the concepts and applications of complex analysis in mathematical modelling, physics and many other areas of mathematics especially applied scientific computing.
CO3	Apply appropriate complex analysis techniques in solving science and engineering related problems arising in various fields such as mechanical, electrical, and aerospace.
CO4	Describe use of techniques of complex analysis in applied mathematics and real-life applications.

S. NO	Contents	Contact Hours
UNIT 1	Algebra of complex numbers, the complex plane, polynomials, power series, radius of convergence, transcendental functions, Riemann Sphere, Stereographic Projection.	8

UNIT 2	Analytic functions, Cauchy-Riemann equations, Harmonic functions, Construction of analytic functions.	8
UNIT 3	Linear and bilinear Transformation, cross ratio and conformal mappings.	8
UNIT 4	Line integral in the Complex Plane, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of Analytic functions, Morera's theorem, Cauchy's estimate, Liouville's theorem, Fundamental theorem of Algebra.	9
UNIT 5	Taylor Series and Laurent Series, Singularities, types of singularities, zeros and poles, Residues, Residue theorem and its applications to evaluate improper real integrals.	9
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Functions of One Complex Variable; J. B. Conway, Springer	2012
2	Complex Analysis; J. Bak, D. J. Newman.	2017
3	Churchill and Brown, Complex Analysis with applications, Dennis G. Zill & Shanahan, Jones & Bartlett (student edition) 2nd Edition.	2009
4	Complex Variable; Schaum Series.	2009
5	Complex Analysis; A. Bourchtein, L. Bourchtein, Springer, 1st edition.	2021

B. Tech. Production and Industrial Engineering

Course code: Course Title	Course Structure			Pre-Requisite
PE104:Engineering	**L**	**T**	**P**	

Materials and Metallurgy	**3**	**0**	**2**	**NIL**

Course Objective: This course helps to understand how and why the properties of materials are controlled by structure and bonding at the atomic-scale, and by features at the microstructural and macroscopic levels and the design, selection and processing of materials for a wide range of applications in engineering and elsewhere. Also, help in understanding how and why the structure and composition of a material may be controlled by processing.

S. NO	Course Outcomes (CO)
CO1	Interprets the changes in Mechanical properties of a Crystal structure with increased defects in the crystal structure
CO2	Correlates between the Type of Corrosion with the material composition and Operating conditions.
CO3	Relate between the Carbon content, Cooling rate, and Mechanical properties.
CO4	Correlates the type of fracture obtainable based on the type of loading and the material used.
CO5	Categorises different Composite materials used in manufacturing Industry based on the matrix and the reinforcement.
CO6	Chooses type of Powder Metallurgy Technique to be adopted for selected components to be manufactured in the industry.

S. NO	Contents	Contact Hours
UNIT 1	Structure of metal: Crystal structure, miller indices for cubic and HCP crystals. Crystal imperfections and their effect on Mechanical properties of the material. Plastic deformation of single and Poly crystalline materials.	7
UNIT 2	Materials: Plain Carbon steels, effect of alloying elements, properties and uses, tool steels, stainless, wear resisting steels. Composition, properties, and use of non-ferrous alloys e.g. Aluminum, Copper and Zinc alloys. Corrosion: Types of corrosion, Galvanic cell, rusting of Iron, Methods of protection from corrosion.	7
UNIT 3	Solidification: Phases in metal system, lever rule, solidification of metal and alloys, solid solution, eutectic, eutectoid and inter-metallic compounds, Iron carbon equilibrium diagram, TTT-diagram. Heat Treatment: Heat treatment of Ferrous and Nonferrous materials, case hardening. Strengthening mechanisms.	7

UNIT 4	Fracture: Types of Fracture of metals and alloys, brittle and ductile, fracture, fatigue failure, effect of alloying elements, design consideration. Creep: Basic consideration in the selection of material for high and low temperature service, Creep curve, effect of material variables on creep properties, brittle failure at low temperature.	7
UNIT 5	Composite materials: Classification of the Composite material based on the reinforcement, characteristics, application of composite materials in industry.	7
UNIT 6	Powder Metallurgy: Principles, techniques, application, and advantages. Surface treatment.	7
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Materials science and engineering: An introduction, William D. Callister, Jr,6e, John Wiley & Sons, Inc, ISBN-13: 978-0470556733	2010
2	Material Science &Engineering, V. Raghavan; 5e; Prentice Hall India learning Pvt. Ltd., ISBN: 978-81-203-2455-8	2004
3	Material Science &Engineering, William F. Smith, Javed Hashemi, Ravi Prakash, 5e, McGraw Hill Edn(India) Pvt. Limited; ISBN: 978-1-25-906275-9	2017
4	Materials & Processes in Manufacture, Degarmo E. Paul et.al, Prentice Hall India, New Delhi, ISBN-13-978-81-265-1336-9.3	1997
5	Engineering Metallurgy Part 1, Raymond A Higgim, Prentice Hall India, New Delhi, ISBN-13: 978-0340046401	1965
6	Principles of Engineering Metallurgy, L. Krishna Reddy, New Age Publication, New Delhi, ISBN: 978-81-224-2202-3	2008
7	Engineering Materials & Properties, Budinski et al, Prentice Hall India, New Delhi, ISBN-13: 978-0137128426	2009
8	Material science, metallurgy and Engineering materials, 1e, Dr. K. M. Gupta, Umesh Publications, ISBN:978-933-80117-69-0	2010
9	Mechanical Metallurgy, George E. Deiter, 1e, McGraw Hill Book company, ISBN: 0-07-100406-8	2017
10	Elements of Material science and Engineering, Lawrence H. Van.Vlack, 6e, Pearson education Inc, ISBN: 978-81-317-0600-8	2002

B. Tech. Software Engineering

Course code: Course Title	Course Structure			Pre-Requisite
SE104: Fundamentals of Software Engineering	**L**	**T**	**P**	**NIL**
	3	**1**	**0**	

Course Objective: Students of Software Engineering are to work with software in the company. Students should get familiar with the basic knowledge of software engineering for developing a product. This course will provide students a sufficient knowledge of software development models, categories of software requirements, criterion for designing an efficient software. Thus, this course will enable students to develop a software according to user requirements using appropriate software development process.

S. NO	Course Outcomes (CO)
CO1	Describe the phases of software development life cycle for designing an efficient software.
CO2	Identification of user requirements using various requirements elicitation techniques.
CO3	Describe the procedure of designing software requirement specification for designing software as per user requirements.
CO4	Describe the basics of software design using various techniques.

S. NO	Contents	Contact Hours
UNIT 1	Introduction: Software, Program, Software Crisis and Solutions, Software Evolution, Software Development Paradigm, Need of Software Engineering, Software Processes, Software Characteristics, Attributes of Software Product, Software Myths, Software basic terminologies, Characteristics of good software.	10
UNIT 2	Software life cycle models: Build and Fix, Waterfall, Prototype, Iterative Enhancement, Rapid Application Development, Evolutionary, Prototyping, and Spiral Model.	12
UNIT 3	Software Requirements Analysis and Specifications: Requirement Engineering, Types of Requirements. Requirement Elicitation: Interview, Brainstorming, Quality Functional Deployment, Use Case Approach.	10
UNIT 4	Requirements Analysis: Problem Analysis, Data Flow Diagrams, Data Dictionaries, Entity-Relationship Diagram, Requirements Documentation, Requirements Validation, Software Requirement and Specifications, Requirements Management, Change Management Form, Structure of SRS, IEEE Std 830-1993, Software Prototyping.	12

UNIT 5	Software Design: Design framework, Conceptual and Technical Design, Trade-off between modularity and software cost, Cohesion and Coupling, Types of cohesion and coupling, strategy of design, Structure chart, IEEE standard 1016-1998 for Software Design Description.	12
	TOTAL	**56**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Software Engineering; K. K. Aggarwal, Y. Singh, New Age International Private Limited, 4th edition.	2017
2	Software Engineering – A practitioner's approach; R. S. Pressman, McGraw Hill Int. Ed, 6th edition.	2017
3	Software Engineering Concepts; R. Fairley, McGraw Hill Education.	2017
4	An Integrated Approach to Software Engineering; P. Jalote, Narosa.	2005
5	Software Engineering; I. Sommerville, Pearson Education, 10th edition.	2017

Syllabi of Skill Enhancement Courses (SEC)

B. Tech. Biotechnology