

Order No.	Course Code	Program Name	Course Name	Credit Hours	Course Semester	Course introduction	Reference Books
I	HUM 111	B.Sc. (Engg.) Metallurgy and Materials Engineering	Functional English	3	Semester-I	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Comprehend structure and composition of sentence in order to carry out productive writing practice and coherent paragraph development. 2. Act confidently in different learning approaches connected to error free listening, reading and speaking aids. 3. Actively participate in a group discussion, valuing other thoughts with sharing own ideas logically 4. Present a given topic in a logical manner. 	<ol style="list-style-type: none"> 1. G. Woods, "English grammar for dummies", John Wiley & Sons (2017). 2. G. Nelson, S. Greenbaum, "An introduction to English grammar", Routledge (2017). 3. S. Bailey, "Academic writing: A handbook for international students", Routledge (2017). 4. P. Collins, C. Hollo, "English grammar: An introduction", Macmillan International Higher Education (2016). 5. A. J. Thomson and A. V. Martinet, "Practical English Grammar" Oxford University Press, 3rd Edition (1997). 6. P.C. Wren and H. Martin, "High School Grammar and Composition" Blackie EIT Books (1995). 7. S. Brinand and F. Grellet, "Writing. Intermediate" Oxford Supplement to Skills 4th Edition (1993)
II	NSC 112	B.Sc. (Engg.) Metallurgy and Materials Engineering	Applied Physics	3	Semester-I	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Comprehend the fundamental physical laws related to equilibrium, thermodynamics and reference frames with their applications. 2. Explain particle duality with associated physical laws and its behaviour in nano and mega scales. 3. Explain electricity and magnetism on the basis of their fundamental physical laws and their engineering applications in semi-conductors and disordered media. 4. Comprehend the science behind phonons and its importance in semi-conductors and other optoelectronic applications 5. Analyse the electrical circuits using Kirchhoff's rule with comprehension of AC/DC micro-macro electromechanical systems. 	<ol style="list-style-type: none"> 1. D. Ewen and N. Schurter, "Applied Physics" Prentice Hall, Ed. 11th Edition (2017). 2. D. Halliday and R. Resnik, "Fundamentals of Physics", Willey (2010). 3. J. D. Cutnel, "Physics" Wiley; 8th Edition (2009). 4. M.A. Wahab, "Solid-State Physics: Structure and Properties of Materials", Narosa Publishing House, New Delhi (2005). 5. C. Douglas, Giancoli, "Physics Principles and Applications", Pearson Education (2004). 6. S. Gibilisco, "Applied Physics", McGraw-Hill, (2002). 7. C. Kittle, "Introduction to Solid State Physics", Wiley (2000).

III	NSC 113	B.Sc. (Engg.) Metallurgy and Materials Engineering	Calculus & Analytical Geometry	3	Semester-I	Upon successful completion of the course, the students will be able to: 1. To develop a clear understanding of fundamental concepts of single variable calculus 2. To apply concepts of differentiation and integration to solve complex engineering problems	1. James Stewart, "Essential Calculus: Early Transcendentals", 2nd Edition, Cengage Learning, (2012). 2. Robert T. Smith, Roland B. Minton, "Calculus", McGraw Hill, (2011). 3. George B. Thomas, Jr., Maurice D. Weir, Joel R. Hass, Thomas' "Calculus", Pearson, USA (2010). 4. Earl W. Swokowski, Michael Olinick, Dennis Pence, "Calculus", 2nd Edition Brooks Cole (1993).
IV	CSC 114	B.Sc. (Engg.) Metallurgy and Materials Engineering	Applications of Information and Computer Technologies	3	Semester-I	Upon successful completion of the course, the students will be able to: 1.Explain the fundamental concepts, components, and scope of Information and communication Technologies (ICT). 2.Identify uses of various ICT platforms and tools for different purposes. 3.Apply ICT platforms and tools for different purposes to address basic needs in different domains of daily, academic, and professional life. 4.Understand the ethical and legal considerations in use of ICT platforms and tools.	1.E. Vermaat, Susan L. Sebok, Steven M. Freund, "Discovering Computers: Digital Technology, Data, and Devices", Cengage Learning (2018) 2.Chrisanthi Avgerou Danny Quah Roger Silverstone Robin Mansell, "The Oxford Handbook of Information and Communication Technologies", 1st Edition, Oxford University Press (2009) 3.Eric Frick, "Information Technology Essentials Volume 1: Introduction to Information Systems", Indepent publishing (2019)
V	MME 115	B.Sc. (Engg.) Metallurgy and Materials Engineering	Fundamentals of Metallurgy and Materials Engineering	3	Semester-I	Upon successful completion of the course, the students will be able to: 1.Describe the potential market of a metallurgical engineer and explain the properties and classification of various metallic & non-metallic materials. 2.Explain branches of metallurgy and the various processes involved in it. 3.Give examples of new materials for cutting-edge applications 4.Elaborate the basics of crystallography, atomic structure to physical & chemical properties relationship.	1.W. D. Callister, "Materials Science and Engineering: An Introduction", John Wiley and Sons, 10th Edition (2018). 2.W.F. Smith, "Principles of Materials Science Engineering", McGraw Hill, (2005). 3.S. H. Avner, "Introduction to Physical Metallurgy", Tata McGraw-Hill, Inc., (1997).
VI	MME 116	B.Sc. (Engg.) Metallurgy and Materials Engineering	Engineering Drawing	1	Semester-I	Upon successful completion of the course, the students will be able to: 1.Use their knowledge to draw engineering objects in first & third angle of projections 2.Follow general instructions while performing lab activity.	

VII	HUM 117	B.Sc. (Engg.) Metallurgy and Materials Engineering	The Holy Quran Translation	1	Semester-I	Upon successful completion of the course, the students will be able to: 1.Understand the translation and explanation of the Holy Quran 2.Demonstrate and practice the way of life in the light of teachings of Holy Quran	
I	MDS 121	B.Sc. (Engg.) Metallurgy and Materials Engineering	Computer Aided Design	1	Semester-II	Upon successful completion of the course, the students will be able to: 1.Comprehend the basics of modern designing software. 2.Use computer-based software to design engineering objects in different angle of projections.	1.A. Saxena and B. Sahay “Computer Aided Engineering Design”, Springer (2005) 2.Wilson R Nyemba, “Computer Aided Design: Engineering Design and Modeling using AutoCAD”, 1st Edition, CRC Press, (2022)
II	HUM 122	B.Sc. (Engg.) Metallurgy and Materials Engineering	Islamic Studies/Ethics*	2	Semester-II	Upon successful completion of the course, the students will be able to: 1.Describe living with peace, respect and free from stress. 2.Respect the doings and cultures of other religions. 3.Understand the Halal and Haram and to find the ways to eliminate haram things in their lives. 4.Practice the life as per commands of Quran and Sunnah.	1.Akhtar H M, “Islamiat”, Allied Book Sons (2012). 2.AI-Bukhari—Vol, S. 7, Book 71, Hadith 648. Sunnah.com—Sayings and teachings of Prophet Muhammad 3.M. Hamidullah, “The Muslim conduct of state”, The Other Press. 4.A. Maududi “Towards Understanding Islam, Updated for a Modern World”, Idara Tarjuman ul Quran. 5.M. Hamidullah, “Introduction to Islam” CSS Point.
III	MME 123	B.Sc. (Engg.) Metallurgy and Materials Engineering	Engineering Mechanics	3	Semester-II	Upon successful completion of the course, the students will be able to: 1.Compute various linear, shear and torsional stresses in different types of structural members. 2.Calculate various stresses under combined loading using Mohr’s circle.	1.F. P. Beer, “Mechanics of Materials”, McGraw-Hill 6th Edition (2016). 2.A. Pytel, “Strength of Materials”, Harper & Row Publishers, (2009). 3.M. F. Ashby, “Engineering Materials 1: An Introduction to Their Properties and Applications”, Butterworth-Heinemann (2005). 4.P. P. Benham, “Mechanics of Engineering Materials”, Pitman (2000).

IV	MDS 124	B.Sc. (Engg.) Metallurgy and Materials Engineering	Occupational Safety, health and environment	2	Semester-II	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Comprehend safety standards that must be maintained in compliance with regulatory requirements and within engineering limits. 2. Demonstrate an understanding of workplace injury prevention, risk management and incident investigations. 3. Comprehend the acute and chronic health effects of exposures to chemical, physical and biological agents in the workplace. 4. Comprehend the policies, procedures and 	<ol style="list-style-type: none"> 1. C Ray Asfahl, David W. Rieske, "Industrial Safety and Health Management", 7th Edition, Pearson, (2018) 2. J. Ridley and J. Channing, "Safety at Work", 7th Edition, Routledge (2007) 3. E. Ferrett and P. Hughes, "Introduction to Health and Safety at Work", 3rd Edition, Butterworth-Heinemann (2007)
V	NSC 125	B.Sc. (Engg.) Metallurgy and Materials Engineering	Applied Chemistry	3	Semester-II	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Explain basic concept of chemical reactions, their kinetics and governing laws. 2. Comprehend basic knowledge of organic and analytical chemistry in metallurgy and materials engineering. 3. Apply stoichiometric calculations to metallurgy related problems. 	<ol style="list-style-type: none"> 1. D.E Lewis, "Advanced Organic Chemistry", Oxford University Press (2015). 2. A. Bahl, "Advanced Organic Chemistry", S. Chand Company (2010). 3. E. A. Parnell, "Applied Chemistry", D. Appleton & Co., (2007). 4. Butts, "Metallurgical Problems", Johnston Press, (2007). 5. T. E. Brown, "Chemistry: The Central Science", Prentice Hall, (2005). 6. D. M. Himmelblau, J. B. Riggs, "Basic Principles and Calculations in Chemical Engineering", Prentice Hall, (2003). 7. H. D. Gasser, "Applied Chemistry", Springer, (2002). 8. C. Davies, "Calculations in Furnace Technology", Elsevier, (1970).
VI	HUM 126	B.Sc. (Engg.) Metallurgy and Materials Engineering	Civic & Community Engagement	2	Semester-II	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Demonstrate fundamental understanding of civics, government, citizenship and civil society. 2. Understand the concept of community and recognize the significance of community engagement for individuals and groups. 3. Recognize the importance of diversity and inclusivity for societal harmony and peaceful co-existence. 	<ol style="list-style-type: none"> 1. Kristen Mattson., "Digital Citizenship in Action: Empowering Students to Engage in Online communities", International Society for Technology in Education, (2017) 2. James Younis and Peter Levine., "Engaging Youth in Civic Life", Vanderbilt University Press, (2009) 3. McGraw-Hill, "Civics Today: Citizenship, Economics, & You", 3rd Edition, Glencoe/McGraw-Hill, (2006) 4. Will Kymlicka and Wayne Norman, "Citizenship in Diverse Societies", 1st Edition Oxford University Press (2000)

VII	MDS 127	B.Sc. (Engg.) Metallurgy and Materials Engineering	Mineral Processing	3	Semester-II	Upon successful completion of the course, the students will be able to 1.Comprehend an overview of major classes of mineral processing equipment, their typical applications, and the types of projects in which they are used. 2.Describe principles and operations involved in various concentration processes	1.Barry A. Wills, "Wills' Mineral Processing Technology", Butterworth-Heineman 8th Edition (2015). 2.T. Rosenqvist, "Principles of Extractive Metallurgy", Tapir Academic Press, (2004). 3.M. C. Fuerstenau and N. H. Kenneth, "Principles of Mineral Processing", Society for Mining Metallurgy & Exploration (2003). 4.J. Newton, "Extractive Metallurgy", John Wiley & Sons Inc (1959).
VIII	HUM 128	B.Sc. (Engg.) Metallurgy and Materials Engineering	The Holy Quran Translation	0	Semester-II	Upon successful completion of the course, the students will be able to: 1.Comprehend the translation and explanation of the Holy Quran 2.Demonstrate and practice the way of life in the light of teachings of Holy Quran	
I	HUM 211	B.Sc. (Engg.) Metallurgy and Materials Engineering	Expository Writing	3	Semester-III	Upon successful completion of the course, the students will be able to: 1.Understand the essentials of the writing process integrating pre-writing, drafting, editing and proof reading to produce well-structured essays. 2.Demonstrate mastery of diverse expository types to address different purposes and audiences. 3.Uphold ethical practices to maintain originality in expository writing.	1. Rise B. Axelrod and Charles R. Cooper, "The St. Martin's Guide to Writing" 13th Edition, Bedford/St. Martin's (2021) 2.Joseph M. Williams and Joseph Bizup, "Style: Lessons in Clarity and Grace", 13th Edition, Pearson (2020) 3.Gerald Graff and Cathy Birkenstein, "They Say / I Say: The Moves That Matter in Academic Writing", 4th Edition, W. W. Norton & Company, (2018) 3.David Rosenwasser and Jill Stephen, "Writing Analytically" 8th Edition, Cengage Learning (2018). 4.William Strunk Jr. and E.B. White., "The Elements of Style", 4th Edition, Pearson, (1999) 5.Richard Johnson-Sheehan and Charles Paine, "Writing Today", 3rd Edition, Pearson (2016)
II	MME 212	B.Sc. (Engg.) Metallurgy and Materials Engineering	Physical Metallurgy	3	Semester-III	Upon successful completion of the course, the students will be able to: 1.Comprehend fundamentals of crystallography. 2.Interpret various microstructures, phases and their formation. 3.Explain various phase diagrams, related calculations and thermodynamics involved in them. 4.Explain metallography sample preparation methods.	1.W. D. Callister, "Materials Science and Engineering: An Introduction", John Wiley & Sons, Inc. 10th Edition (2018). 2.W.F. Hosford, "Physical Metallurgy", CRC Press Ltd. (2005). 3.S. H. Avner, "Introduction to Physical Metallurgy", Tata McGraw-Hill, Inc. (1997). 4.J. D. Verhoeven, "Fundamentals of Physical Metallurgy", John Wiley & Sons (1975).

III	MME 213	B.Sc. (Engg.) Metallurgy and Materials Engineering	Workshop Practice	1	Semester-III	Upon successful completion of the course, the students will be able to: 1.Practice various hand and machine tools to fabricate an engineering object. 2.Practice health & safety measures in working environment	
IV	MME 214	B.Sc. (Engg.) Metallurgy and Materials Engineering	Iron Manufacturing	2	Semester-III	Upon successful completion of the course, the students will be able to: 1.Explain the operational procedure and products of blast furnace. 2.Comprehend alternative routes of iron making other than BF. 3.Calculate Charge for blast furnace.	1.R. H. Tupkary, et al., "An Introduction to Modern Iron Making", Khanna Publishers (2010). 2.S. H. Avner, "An Introduction to Physical Metallurgy", Tata McGraw-Hill, Inc., 2nd Edition (2010). 3.J.J. Moore, "Chemical Metallurgy", Butterworth-Heinemann (1990). 4.C. Bodsworth, "Physical Chemistry of Iron and Steel Manufacture", Prentice Hall (1972). 5.J. G. Peacey, W. G. Daveonport, "The Iron Blast Furnace", Pergamon Press (1979). 6.A. Butts, "Metallurgical Problems", McGraw-Hill Book Company, (1971). 7.J. Newton, "Extractive Metallurgy", John Wiley & Sons Inc (1959). 8.R. H. Parker, "An Introduction to Chemical Metallurgy", Pergamon (1967). 9.H. E. McGannon, "The Making, Shaping and
V	CSC 214	B.Sc. (Engg.) Metallurgy and Materials Engineering	MATLAB and Python	3	Semester-III	Upon successful completion of the course, the students will be able to: 1.Comprehend the general concepts of programming and obtain a solid foundation in the use of MATLAB and Python. 2.Write moderate-size programs that solve engineering problems	1.W. Boober, "MATLAB Essentials: A First Course for Engineers and Scientists", CRC Press (2018). 2.H. Moore, "MATLAB for Engineers", Pearson (2017) 3.M. Delores, "Introduction to MATLAB", Prentice Hall, 3rd edition (2014) 4.Paul Barry, "Head-First Python", O'Reilly Media, 2nd edition (2016) 5.Sandeep Nagar, "Introduction to Python for Engineers and Scientists: Open Source Solutions for Numerical Computation", Apress (2018)
VI	NSC 215	B.Sc. (Engg.) Metallurgy and Materials Engineering	Linear Algebra & Differential Equation	3	Semester-III	Upon successful completion of the course, the students will be able to: 1.To comprehend basic concepts of Linear Algebra and optimization 2.To apply techniques of Linear Algebra and optimization for solution of engineering problem.	1.Glyn James, "Modern Engineering Mathematics", 6th Edition, Pearson (2020) 2.Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley & Sons, Inc. (2010) 3.Dennis G. Zill and Michael Cullen, "Differential Equations", 3rd Edition, Brooks Cole (1992)

VII	HUM 216	B.Sc. (Engg.) Metallurgy and Materials Engineering	Ideology & Constitution of Pakistan	2	Semester-III	Upon successful completion of the course, the students will be able to: 1.Demonstrate enhanced knowledge of the basis of the ideology of Pakistan with special reference to the contributions of the founding fathers of Pakistan. 2.Demonstrate fundamental knowledge about the Constitution of Pakistan 1973 and its evolution with special reference to state structure. 3.Explain about the guiding principles on rights and responsibilities of Pakistani citizens as enshrined in the Constitution of Pakistan 1973.	1.Javid Iqbal, "Ideology of Pakistan", Sang-e-Meel Publications (2005). 2.I.H. Qureshi, "The Struggle for Pakistan", University of Karachi (1965) 3.Khalid Bin Sayeed, "Pakistan the Formative Phase 1857-1948", 2nd Edition, Oxford University Press (1991) 4. Safdar Mahmood, "Pakistan: Political Roots and Development 1947-1999", Oxford University Press (2003)
VIII	HUM 217	B.Sc. (Engg.) Metallurgy and Materials Engineering	The Holy Quran Translation	1	Semester-III	Upon successful completion of the course, the students will be able to: 1.Understand the translation and explanation of the Holy Quran 2.Demonstrate and practice the way of life in the light of teachings of Holy Quran	
I	MME 221	B.Sc. (Engg.) Metallurgy and Materials Engineering	Mechanical Behaviour of Engineering Materials	4	Semester-IV	Upon successful completion of the course, the students will be able to: 1.Explain plastic and elastic deformation phenomenon of engineering materials. 2.Comprehend basic knowledge of fracture mechanics under various circumstances.	1.W. D. Callister, "Materials Science and Engineering: An Introduction", John Wiley & Sons, Inc., 10th Edition (2018). 2.T. H. Courtney, "Mechanical Behavior of Materials", McGraw-Hill (2000). 3.F. Karim, "Testing of Engineering Ceramics and Plastics", Ferozsons (Pvt.) Ltd. (1998). 4.W. F. Smith, "Principles of Materials Science and Engineering", McGraw-Hill (1995).

II	MME 222	B.Sc. (Engg.) Metallurgy and Materials Engineering	Polymer Science and Engineering	4	Semester-IV	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Comprehend chemistry, types, structures, properties and applications of polymeric materials 2. Explain processing techniques and their controlling parameters for production of defect free products 3. Select and employ a suitable polymer and sophisticated processing technique for the manufacture of specific polymer product keeping in view economics and environmental issues. 4. Identify impact of polymeric materials on environment. 	<ol style="list-style-type: none"> 1. W. D. Callister, "Materials Science and Engineering: An Introduction", John Wiley and Sons, Inc, 10th Edition (2018). 2. F.W. Billmeyer, "TextBook of Polymer Science", 3rd Edition (2013). 3. P. Bahadur, "Principles of Polymer Science", Narosa publishing house (2003). 4. W. F. Smith, "Principles of Materials Science and Engineering", McGraw Hills, 3rd Edition (2003). 5. Sinha, "Outlines of Polymer Technology: Manufacture of Polymers", Phi learning (2002). 6. A. Brent Strong, "Plastics: Materials and Processing", 2nd Edition (2000). 7. M. Chanda and S. K. Roy, "Plastics Technology Handbook", CRC Press (1998).
III	MME 223	B.Sc. (Engg.) Metallurgy and Materials Engineering	Materials Thermodynamics	3	Semester-IV	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Comprehend the terms and laws related to thermodynamics such as entropy, heat capacity, Gibbs free energy, and laws of thermodynamics (zeroth, first, second and third). 2. Apply the laws of thermodynamics to calculate enthalpy/entropy of reaction, Gibbs free energy, and heat of reaction at high temperatures in engineering processes like extraction/refining reactions, alloy melting, heat treatment, and corrosion. 3. Analyze the feasibility of various redox reactions involved in extraction and refining processes under given conditions using Ellingham diagrams and G-K (Gibbs free energy change & equilibrium constant) 	<ol style="list-style-type: none"> 1. Y. A. Chang, W. Alan Oates, "Materials Thermodynamics (Wiley Series on Processing of Engineering Materials)", Wiley Series, 2nd Edition (2015). 2. Y. A. Cengel, "Thermodynamics: An Engineering Approach", 5th Edition (2010). 3. A. Bahl, B.S. Bahl, et al. "Essentials of Physical Chemistry", S. Chand (2000). 4. R. Joel, "Basic Engineering Thermodynamics", Longman (1996). 5. D. R. Gaskell, "Introduction to Metallurgical Thermodynamics", Taylor & Francis (1981). 6. G. S. Upadhyaya et.al "Problems in Metallurgical Thermodynamics and Kinetics", Pergamon, (1977).
IV	MME 224	B.Sc. (Engg.) Metallurgy and Materials Engineering	Foundry Engineering-1	2	Semester-IV	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Comprehend the basic foundry operations with respect to other manufacturing techniques 2. Explain the functions of various raw materials, patterns and cores for molding 3. Explain various casting manufacturing routes, machines in foundry and related defects 4. Recognize impact of various foundry materials on environment 	<ol style="list-style-type: none"> 1. R. W. Heine, C. R. Loper and P.C. Rosenthal, "Principles of Metal Casting", Tata McGraw-Hill, Inc. (2014). 2. J. Campbell, "Castings", Butterworth-Heinemann (2003). 3. J. R. Brown, "The Foseco Non-Ferrous Foundryman's Handbook", Butterworth-Heinemann, (1999). 4. N. K. Srinivisan, "Foundry Engineering", Khanna Tech. Publications India (1991). 5. R. A. Flinn, "Fundamentals of Metal Casting", Addison Wesley Inc. (1983).

V	MSC 225	B.Sc. (Engg.) Metallurgy and Materials Engineering	Project Management	2	Semester-IV	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1.Develop competencies in project costing, budgeting, and financial appraisal 2.Gain exposure to project Planning Control and Management, using standard tools and schedule variance analysis; 3.Appreciate the elements of risk and quality in hi-tech projects; 4.Learn appreciate and understand the use of computers in Project Management, especially a tool like MS Project & Primavera etc. 	<ol style="list-style-type: none"> 1.Harold Kerzner, "Project Management: A system Approach to Planning, Scheduling and Controlling", 11th Edition, John Wiley & Sons Inc (2013) 2.Cleland, David. I., "Field guide to project management", Wiley (2004) 3.Eisner, H., "Essentials of project management and systems engineering management", Wiley (2008)
VI	NSC 226	B.Sc. (Engg.) Metallurgy and Materials Engineering	Numerical Analysis	3	Semester-IV	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1.Comprehend different numerical techniques such as: error propagation, interpolation, differentiation, integration, eigenvalues and solution of algebraic and differential equations 2.Apply the numerical techniques to different linear and nonlinear engineering problems. 	<ol style="list-style-type: none"> 1.Steven C. Chapra and R. P. Canale, "Numerical Methods for Engineers", McGraw-Hill Education, 8th edition (2020). 2.Richard L. Burden and J. Douglas Faires, "Numerical Analysis", Cengage Learning, 10th edition. (2015) 3.R.W. Hamming, "Numerical Methods for Scientists and Engineers", Dover Publications, 2nd edition. (1987)
VII	HUM 227	B.Sc. (Engg.) Metallurgy and Materials Engineering	The Holy Quran Translation	0	Semester-IV	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1.Understand the translation and explanation of the Holy Quran 2.Demonstrate and practice the way of life in the light of teachings of Holy Quran 	

I	NSC 311	B.Sc. (Engg.) Metallurgy and Materials Engineering	Statistical Methods	3	Semester-V	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Comprehend key concepts of statistical measures, probability principles, and distribution properties to analyze and interpret data effectively. 2. Apply advanced statistical methods and techniques to perform comprehensive data analysis and draw meaningful inferences from various datasets. 	<ol style="list-style-type: none"> 1. Jay L. Devore, Nicholas R. Farnum, Jimmy A. Doi, "Applied Statistics for Engineers & Scientists", 3rd edition. Cengage Learning, (2013) 2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, "Probability and Statistics for Engineers and Scientists", 8th Edition Pearson Educational International, (2007) 3. Jay L. Devore, "Probability and Statistics for Engineering and Sciences", 8th edition, Cengage Learning (2011) 4. Erwin Kreyszig, "Advanced Engineering Mathematics", 11th edition, John and Wiley and Sons. (2011) 5. Montgomery and Runger, "Applied Statistics and Probability for Engineers", 3rd edition John and Wiley and Sons. (2002) 6. Papoulis Athanasios, "Probability and Random Variables and Stochastic Processes", 4th edition McGraw-Hill Inc. (2002)
II	MME 312	B.Sc. (Engg.) Metallurgy and Materials Engineering	Foundry Engineering-II	3	Semester-V	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Comprehend solidification phenomenon of pure metals and alloys. 2. Calculate Charge for production of various alloys. 3. Explain manufacturing routes of various metals, alloys and related metal treatment processes. 4. Design most favorable gating and risering system for a particular casting. 	<ol style="list-style-type: none"> 1. R. W. Heine, C. R. Loper and P.C. Rosenthal, "Principles of Metal Casting", Tata McGraw-Hill, Inc. (2014). 2. J. Campbell, "Castings", Butterworth-Heinemann (2003). 3. P. Beeley, "Foundry Technology", Butterworth-Heinemann (2001). 4. J. R. Brown, "The Foseco Non-Ferrous Foundryman's Handbook", Butterworth-Heinemann, 11th Edition (1999). 5. J. R. Brown, "The Foseco Foundryman's Handbook", Butterworth-Heinemann, 10th Edition (1999). 6. R. W. Heine, C. R. Loper et al. "Principles of Metal Casting", Tata McGraw-Hill (1976). 7. R. Elliot, "Cast Iron Technology", Butterworth-

III	MME 313	B.Sc. (Engg.) Metallurgy and Materials Engineering	Heat Treatment of Metals and Alloys	4	Semester-V	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1.Explain the theory of phase transformation. 2.Apply the knowledge of various heat treatment processes to develop required microstructures. 	<ol style="list-style-type: none"> 1.E. Oberg, "Heat treatment of Steel", Owen Press (2016). 2.S. H. Avner, "An Introduction to Physical Metallurgy", Tata McGraw-Hill, Inc., 2nd Edition (2010). 3.R. W. K. Honeycombe et al. "Steels: Microstructure and Properties", Butterworth-Heinemann, (2006). 4.G. E. Totten, "Steel Heat Treatment: Metallurgy and Technologies", CRC Press (2006). 5.J. W. Christian, "The Theory of Transformations in Metals and Alloys", Pergamon (2002). 6.D. A. Porter et al. "Phase Transformations in Metals and Alloys", Chapman and Hall (2001). 7.R. E. Smallman et al. "Modern Physical Metallurgy and Materials Engineering", Butterworth-Heinemann (1999). 8.J. W. Martin, "Precipitation Hardening", Butterworth-Heinemann (1998) 9.Ge. Krauss, "Steels: Heat Treatment and Processing Principles", ASM International (1990).
IV	MME 314	B.Sc. (Engg.) Metallurgy and Materials Engineering	Ceramic Science & Engineering	4	Semester-V	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1.Comprehend raw materials, structures, properties and applications of ceramic materials 2.Describe the process of how ceramic materials are produced and how their properties can be enhanced. 3.Select suitable raw materials and explain processing techniques for producing a ceramic product on the basis of fundamental knowledge of ceramics, properties, structure and processing. 	<ol style="list-style-type: none"> 1. W. D. Callister, "Materials Science and Engineering: An Introduction", John Wiley and Sons, Inc, 10th Edition (2018). 2. Kingery, H. K. Bowen, et.al "Introduction to Ceramics", Wiley, 2nd Ed. (2004). 3. M. W Barsoum, "Fundamental of Ceramics" IOP (2003). 4. W. F. Smith, "Principles of Materials Science and Engineering", Mcgraw Hills, 3rd Edition (2003). 5. W. E. Worrall, "Ceramic Raw Materials", Pregamon Press, (1982). 6. W. Rayan, "Properties of Ceramic Raw Materials", Pregamon Press, 2nd Edition (1978).

V	MME 315	B.Sc. (Engg.) Metallurgy and Materials Engineering	Metallurgical Manufacturing Processes	3	Semester-V	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Comprehend fundamentals of different manufacturing processes 2. Select a suitable manufacturing process to produce a given component 	<ol style="list-style-type: none"> 1. H.A. Youssef et al., "Manufacturing Technology: Materials, Processes, and Equipment", CRC press (2011). 2. M. P. Groover, "Fundamentals of Modern Manufacturing: Materials, Processes, and Systems", John Wiley & Sons, Inc. (2007). 3. H. Geng, "Manufacturing Engineering Handbook", McGraw-Hill (2004). 4. S. Kalpakjian et al. "Manufacturing Processes for Engineering Materials", Pearson Education, Inc., (2003). 5. E. P. DeGarmo, J. T. Black et al. "Materials and Processes in Manufacturing", Wiley (2002). 6. R. C. Creese, "Introduction to Manufacturing Processes and Materials", Taylor and Francis, (1999). 7. B. H. Amstead, P. F. Ostwald and M. L. Begeman, "Manufacturing Processes", John Wiley & Sons, (1987).
VI	HUM 316	B.Sc. (Engg.) Metallurgy and Materials Engineering	The Holy Quran Translation	1	Semester-V	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Understand the translation and explanation of the Holy Quran 2. Demonstrate and practice the way of life in the light of teachings of Holy Quran 	

I	MME 321	B.Sc. (Engg.) Metallurgy and Materials Engineering	Corrosion Engineering	4	Semester-VI	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Compare/classify various type of corrosion 2. Apply basic thermodynamic knowledge to estimate/ predict the corrosion process and rate under various circumstances 3. Analyze the effects of passivity and polarization on corrosion behavior of metals using their passivity and polarization curves and data 4. Suggest and apply the most suitable corrosion protection techniques and correct combination of alloys, design and operation conditions keeping consideration to sustainable environment. 	<ol style="list-style-type: none"> 1. D. E.J. Talbot, J. D.R. Talbot, "Corrosion Science and Technology", CRC Press- Technology & Engineering (2018). 2. I. H. Khan, "Corrosion Technology", Vol-I, AFAQ Publications, 2nd Edition (2010). 3. P. R. Roberge, "Corrosion Engineering, Principles and Practice", McGraw-Hill Companies, Inc., (2008) 4. H. H. Uhlig; R. Winston Revie, "Corrosion and Corrosion Control", John Wiley & Sons, 4th Edition (2008). 5. Z. Ahmad, "Principles of Corrosion Engineering and Corrosion Control", Elsevier Science & Technology Books (2006). 6. M. G. Fontana, "Corrosion Engineering", Tata McGraw-Hill (2006). 7. D. Stephen Cramer and S. Bernard Covino, ASM Handbook Volume 13 "Corrosion", ASM International (2005) 8. K. R. Trethewey, "Corrosion for Science & Engineering", Addison Wesley Longman (1996).
II	MME 322	B.Sc. (Engg.) Metallurgy and Materials Engineering	Welding and Joining Processes	4	Semester-VI	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Comprehend various metal joining processes of engineering materials. 2. Analyse metallurgical weldments to ensure quality. 3. Explain various types of metal joints and edge preparation. 4. Construct WPS and PQR for a given welding process as per ASME guidelines. 5. Classify various inspection and quality control techniques of weldments. 	<ol style="list-style-type: none"> 1. K. Weman, "Welding processes handbook", 2nd Edition, Woodhead publishing (2011) 2. H. B. Cary and S. C. Helzer, "Modern Welding Technology", Prentice Hall (2004). 3. A. D. Althouse, C. H. Turnquist et.al, "Modern Welding", Goodheart Wilcox Company (2000). 4. A. Pytel, F. L. Singer, "Strength of Materials", Harper & Row Publishers, NY, USA. 5. K. Easterling, "Introduction to the Physical Metallurgy of Welding", Butterworth-Heinemann (2000).
III	HUM 323	B.Sc. (Engg.) Metallurgy and Materials Engineering	Communication and Presentation skills	2	Semester-VI	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Identify barriers to communication and ways to overcome them. 2. Develop their non-verbal and para-verbal communication skills. 3. Design and giving strong, persuasive presentations. 4. Write business messages, e-mails effectively, effective applications and letters. 	<ol style="list-style-type: none"> 1. L. Puthery, "Personality Development and Communication Skills", SIA publishers (2018). 2. A. Clifford, Whitecomb, "Effective Interpersonal and Team Communication Skills for Engineers", Wiley, 1st Edition (2013). 3. J. W Davies, "Communication for Engineering Students", Longman (1995).

IV	MME 324	B.Sc. (Engg.) Metallurgy and Materials Engineering	Steel Manufacturing	3	Semester-VI	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1.Explain the operational procedure and products of the blast furnace. 2.Discuss alternative routes of iron making. 3.Calculate charge for blast furnace. 4.Explain theoretical principles of steel making. 5.Analyse steel melting problems and casting defects. 	<ol style="list-style-type: none"> 1.R. H. Tupkary, "An Introduction to Modern Steel Making", Khanna Publishers, 7th Edition, (2015). 2.A. K. Charabarti, "Steel Making", PHI publishers, (2006). 3.H. E. McGannon, "The Making, Shaping and Treating of Steel", United States Steel, (1964). 4.C. Bodsworth, "Physical Chemistry of Iron and Steel Manufacture", Prentice Hall, (1972). 5.J. J. Moore, "Chemical Metallurgy", Butterworth-Heinemann, (1990). 6.J. Newton, "Extractive Metallurgy", John Wiley & Sons Inc, (1959). 7.R. H. Parker, "An Introduction to Chemical Metallurgy", Pergamon, (1967). 8.V.A. Kadrin, "Steel Making", Mir Publisher, 2nd Edition (1985).
V	CSC 325	B.Sc. (Engg.) Metallurgy and Materials Engineering	Computational Materials Science	3	Semester-VI	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1.Explain the process and components of materials modelling and simulations and interpret the role of modelling and simulation in materials engineering. 2.Identify and explain materials modelling and simulation techniques suitable for the analysis of mechanical behavior of materials under various loading scenarios. 3.Compare different materials modeling and computation techniques to select the right approach for analysis. 	<ol style="list-style-type: none"> 1.R. Lesar, "Introduction to Computational Materials Science: Fundamental to Applications", Cambridge University Press (2013). 2.D. Raabe, "Computational Materials Science: The simulation of Materials, Microstructures and Properties", Wiley (2007).
VI	MME 326	B.Sc. (Engg.) Metallurgy and Materials Engineering	Composite Materials	2	Semester-VI	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1.Comprehend types, properties and applications of composite materials. 2.Explain processing techniques of composite materials. 3.Predict properties of composite materials using principles of micromechanics. 	<ol style="list-style-type: none"> 1.K. Kamal, " Composite Materials: Processing, Applications and Characterization", Springer (2017). 2.W. D. Callister, "Materials Science and Engineering: An Introduction", John Wiley and Sons, Inc, 10th Edition (2018). 3.A. K. Kaw, "Mechanics of composite materials", CRC Press, 2nd Edition (2005). 4.S.T. Peter, "Handbook of composites" Chapman and Hill, (1998). 5.M.M. Schwartz, "Composite Materials Handbook", McGraw-Hill, 2nd Edition (1983).

VII	HUM 327	B.Sc. (Engg.) Metallurgy and Materials Engineering	The Holy Quran Translation	0	Semester-VI	Upon successful completion of the course, the students will be able to: 1.Understand the translation and explanation of the Holy Quran 2.Demonstrate and practice the way of life in the light of teachings of Holy Quran	
I	MME 411	B.Sc. (Engg.) Metallurgy and Materials Engineering	Tribology and Surface Engineering	3	Semester-VII	Upon successful completion of the course, the students will be able to: 1.Explain the mechanism of friction, wear, their remedies and lubrication. 2.Comprehend the various surface cleaning, roughening and hardening processes. 3.Select and apply suitable processes of surface treatment for different applications.	1.R. Chattopadhyay, "Green Tribology, Green Surface Engineering, and Global Warming", ASM International (2014) 2.T. Mang, Kirsten et.al, "Industrial Tribology", WILEY-VCH Verlag & Co. KGaA, Germany (2011) 3.K. Holmberg & A. Matthews, "Coatings Tribology", Elsevier (2009) 4.J. Takadoum, "Materials and Surface Engineering in Tribology", John Wiley & Sons (2008) 5.S. Kalpakjian et.al, "Manufacturing Processes for Engineering Materials", Pearson Education (2003) 6.B. Bhushan, "Modern Tribology Handbook", CRC Press (2001). 7.J. B. Hudson, "Surface Engineering: An Introduction", Butterworth-Heinemann, (2000). 8.B. Bhushan, "Principles and Applications of Tribology", John Wiley & Sons (1999).
II	MME 412	B.Sc. (Engg.) Metallurgy and Materials Engineering	Characterization Techniques	4	Semester-VII	Upon successful completion of the course, the students will be able to: 1.Comprehend types, properties and applications of x-rays. 2.Explain working principle, equipment and applications of various characterization techniques. 3.Analyse data of various characterization techniques.	1.Sharma et al., "Handbook of Materials Characterization", Springer (2018) 2.P. Campos et al., "Materials Characterization", Springer (2015). 3.B.D. Culy, "Elements of X-ray Diffraction", Prentice Hall, 3rd Edition (2002) 4.P. J. Goodhew and F. J. Humphreys, "Electron Microscopy and Analysis", Taylor & Francis (2001). 5.M. E. Brown, "Introduction to Thermal Analysis" Techniques and Applications, Kulwer Academic Publishers (2001) 6.J. B. Wachtman, "Characterisation of Materials", Butterworth-Heinemann (2000). 7.D. Brandon and W. D. Kaplan, "Microstructural Characterisation of Materials", Wiley (1999). 8.N.P. Cheremisinoff, "Polymer Characterization, Laboratory Techniques and Analysis", Noyes Publication, USA (1996)

III	HUM 413	B.Sc. (Engg.) Metallurgy and Materials Engineering	Sociology for Engineers	2	Semester-VII	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1.Introduce to the methods and philosophy of the social science to help their understanding of the socio-cultural dimension of human existence as a fundamental reality in engineering projects etc. 2.To provide opportunity for students to begin the process of considering social problems/ issues while designing engineering products. 3.To allow engineers to play a pro-active role in critical discussions of social issues specifically. 4.To demonstrate comprehension of roles and functions of various social institutions, state organizations, Professional bodies and relationships for analyzing their social impact Assessment. 	<ol style="list-style-type: none"> 1.S.P. Nichlos, W.F Weldon, "Professional Responsibility: The Role of Engineering in Society Center for Electro-mechanics" The University of Texas at Austin, USA (2017). 2.Jamison,A., Christensen, S.H., and Lars, B., "A Hybrid Imagination: Science and Technology in cultural perspective" (2011) 3.Vermaas, P., Kroes P., Poet I., and Houkes,W., "A Philosophy of Technology: From Technical Artefacts to Socio technical systems" (2011) 4.Mitcham, C., and Munoz, D., "Humanitarian Engineering", Morgan and Claypool Publishers (2008) 5.Riley D., "Engineering and Social Justice", Morgan and Claypool Publishers (2010)
IV	MME 414	B.Sc. (Engg.) Metallurgy and Materials Engineering	Nanomaterials and Nanotechnology	2	Semester-VII	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1.Explain properties, synthesis and applications of various nanomaterials. 2.Comprehend the suitability of a nanomaterials for specific applications. 3.Comprehend health and safety issues related to nanomaterials. 	<ol style="list-style-type: none"> 1.M. Benelmekki, "Nanomaterials: The original product of nanotechnology", Morgan & Claypool Publisher (2019). 2.G. Cao and Y. Wang, "Nanostructures & Nanomaterials: Synthesis, Properties & Applications", World Scientific (2011). 3.C. Koch, "Nanostructured materials: Processing, Properties and Applications", William Andrew, Inc., 2nd Edition (2007).
V	CSC 415	B.Sc. (Engg.) Metallurgy and Materials Engineering	Machine Learning in Materials Engineering	3	Semester-VII	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1.Use regression and classification algorithms to predict structure-property relationship for different materials. 2.Compare and analyze the performance of different machine learning models. 3.Apply different machine learning methods to solve a given materials engineering problem. 	<ol style="list-style-type: none"> 1.Machine Learning in Materials Science by K. T. Butler, F. Oviedo, P. Canepa. American Chemical Society (2022). 2.Artificial Intelligence for Materials Science by Y. Cheng, T. Wang, G. Zhang, 1st ed., Springer (2021). 3.Hands-on machine learning with Scikit-Learn, Keras, and TensorFlow by A. Geron. 2nd ed., O'Reilly Media (2019). 4.Deep learning by I. Goodfellow, Y. Bengio, A. Courville. MIT Press (2016).

VI	MME 416	B.Sc. (Engg.) Metallurgy and Materials Engineering	Design Project - I	3	Semester-VII	Group of students will work on design project of industrial scope and importance under the supervision of faculty members. The duration of the project will be two semesters (7th and 8th semester). The students will complete data collection regarding the project, development of design of experiments, development of flow sheet, material selection, and cost estimation. The progress will be monitored through interim presentations and reports. Finally, written thesis will be required, duly approved by the supervisor.	
VII	HUM 417	B.Sc. (Engg.) Metallurgy and Materials Engineering	The Holy Quran Translation	1	Semester-VII	Upon successful completion of the course, the students will be able to: 1.Understand the translation and explanation of the Holy Quran 2.Demonstrate and practice the way of life in the light of teachings of Holy Quran	
I	MME 421	B.Sc. (Engg.) Metallurgy and Materials Engineering	Powder Metallurgy	2	Semester-VIII	Upon successful completion of the course, the students will be able to: 1.Comprehend the basic knowledge of powder metallurgy. 2.Evaluate the complex sintering process and select proper parameters and furnace to successfully produce parts via powder metallurgy route.	1.P.S. Gill, "Principles of Powder Metallurgy", S.K.Kataria Publishers (2015). 2.A. Upadhaya, "Powder Metallurgy: Science, Technology and Materials", Universities Press 1st Edition (2011). 3.R. M. German, "A - Z of Powder Metallurgy", Elsevier Science (2006). 4.W. G. West and L. F. Pease, "Fundamentals of Powder Metallurgy", Metal Powder Industries Federation (2002). 5.R. M. German, "Sintering Theory and Practice", Metal Powder Industries Federation (1996). 6.A. J. Yule and J. D. Dunkley, "Atomization of Melts for Powder Production and Spray Deposition", Clarendon Press (1994). 7.I. H. Khan book, K. A. Qureshi et.al, "Fundamentals of Powder Metallurgy", Institute of Chemical Engineering and Technology, University of the Punjab, Lahore, Pakistan (1988) 8.R. M. German, "Powder Metallurgy Science", Metal Powder Industries Federation (1984). 9.G. H. Gessinger, "Powder Metallurgy of Super alloys", Butterworth-Heinemann (1984).

II	MME 422	B.Sc. (Engg.) Metallurgy and Materials Engineering	Advanced Materials	3	Semester-VIII	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Comprehend types, properties and applications of superalloys, stainless steel, titanium alloys, and various types of biomaterials. 2. Propose the most suitable material for a particular application. 3. Predict the host and biomaterials interaction 	<ol style="list-style-type: none"> 1. H. Vasif et.al., "Fundamentals of Biomaterials, Springer-Verlag New York", 3rd Edition (2018). 2. C. M. Agrawal, J. L. Ong, "Introduction to Biomaterials: Basic Theory with Engineering Applications", Cambridge Texts in Biomedical Engineering, 1st Edition (2014) 3. V. Migonney, "Biomaterials", Wiley, (2014) 4. R. E. Smallman, A. H. W. Ngan, "Modern Physical Metallurgy", Elsevier, 8th Edition (2014). 5. R. C. Reed, "The Superalloys Fundamentals and Applications", Cambridge University Press (2006). 6. E. C. Leyens, M. Peters, "Titanium and Titanium Alloys. Fundamentals and Applications", Wiley (2003). 7. M. J. Donachie, "Superalloys: A Technical Guide",
III	MSC 423	B.Sc. (Engg.) Metallurgy and Materials Engineering	Engineering Management	2	Semester-VIII	<p>Upon successful completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Describe the main managerial responsibilities, tasks, and tools of an engineer applied within different organizational functions 2. Apply the measures for quality control of the product in an organization 3. Analyse the economic and financial aspects of processes in an organization. 	<ol style="list-style-type: none"> 1. S. P. Robbins, Mary Coulter, "Management", Pearson, 14th Edition (2018). 2. S. P. Robbins, Timothy A. Judge, "Organizational Behaviour", Pearson, 17th Edition (2016). 3. J. X. Warg, "What Every Engineer should Know about Business Communication", CRC Press (2008). 4. N. J. Aquilano, R. B. Chase, "Production and Operation Management", Irwin (2007). 5. W. G. Harcourt, "Production and Operation Management", Brace & World (2006). 6. E. S. Buffa, "Modern Production/Operations Management", C. B. S Publications (2003). 7. W. J. Stevenson, "Production/Operations Management", McGraw-Hill (1990).

IV	MSC 424	B.Sc. (Engg.) Metallurgy and Materials Engineering	Entrepreneurship	2	Semester-VIII	Upon successful completion of the course, the students will be able to: 1.Comprehend the terminology and concepts of Entrepreneurship 2.Innovate the ideas necessary for a start-up 3.Prepare a successful business plan and a feasibility analysis	1.Bruce. R. Barringer, R. Duane Ireland, "Entrepreneurship – Successfully Launching New Ventures", 4th Ed., Pearson (2019). 2.S. Read, S. Sarasvathy, N. Dew, R. Viltbank, "Effectual Entrepreneurship", Routledge, 2nd Edition (2018). 3.K. Uchino, "Entrepreneurship for Engineers", Taylor & Francis (2017). 4.W. Naude, "Entrepreneurship and Economic Development", Palgrave Macmillan (2010). 5.P.F. Drucker, "Innovation and Entrepreneurship", Routledge (2007). 6.P. Burns, "Small Business and Entrepreneurship", Palgrave, 8th Edition (2001). 7.J.B. Miner, "4 Routes to Entrepreneurial Success", Berrett Koehler (1996).
V	MME 425	B.Sc. (Engg.) Metallurgy and Materials Engineering	Non-Ferrous Metallurgy	3	Semester-VIII	Upon successful completion of the course, the students will be able to: 1.Explain the properties, sources and applications of various non-ferrous metals and alloys 2.Comprehend various extraction routes for the production of non-ferrous metals.	1.A. Kamble, "A textbook of metallurgy: Properties and Applications of Ferrous and Non-Ferrous alloys" Harshal Publications (2017). 2.F.Cardarelli, "Materials Handbook", Springer (2000). 3.J.J. Moore, "Chemical Metallurgy", Butterworth-Heinemann (1990). 4.C. B. Gill, "Nonferrous Extractive Metallurgy", Krieger Pub Co. (1988). 5.H. S. Ray, R. Sridhar and K. P. Abraham, "Extraction of Non-Ferrous Metals", Affiliated East-west Press (1987). 6.N. Sevryukov, B. Kuzmin and Y. Chelishchev, "General Metallurgy", AIP Publishers (1969)
VI	MME 426	B.Sc. (Engg.) Metallurgy and Materials Engineering	Design Project - II	3	Semester-VIII	Students will continue work on the Design Project Part-I. They will perform experiment on previously designed for the development or modification of materials. Perform characterization of materials using conventional and modern tools. Students will also analyse and interpret data. The modelling and simulation may be carried out, if desired for the project. The progress will be monitored through interim presentations and report. A final report in the form of project thesis will be submitted in approved format at the end of term.	

VII	HUM 427	B.Sc. (Engg.) Metallurgy and Materials Engineering	The Holy Quran Translation	0	Semester-VIII	Upon successful completion of the course, the students will be able to: 1.Comprehend the translation and explanation of the Holy Quran 2.Demonstrate and practice the way of life in the light of teachings of Holy Quran	
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