Metallurgical and Materials Engineering

(3rd Semester)

Detailed Syllabus

OP JINDAL UNIVERSITY
OP Jindal Knowledge Park, Punjipathra, Raigarh - 496109, (C.G.)
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OPJU

Metallurgical and Materials Engineering

L: Lecture, T: Tutorial, P: Practical, C: Credit

Scheme of Teaching and Examination
B. Tech (Metallurgical and Materials Engineering)

Academic Semester III

S. No.	Code	Board of Study	Subject	Periods per week			Scheme of Examination and Marks				Credit L+(T+P)/2
				L	T	P	PRE**		ESE*	Total Marks	
							Mid Sem	TA			
1	MME2101	MME	Introduction to Physical Metallurgy	3	1	0	30	20	50	100	4
2	MME2102	MME	Mineral Dressing	3	1	0	30	20	50	100	4
3	MME2103	MME	Metallurgical Thermodynamics and Kinetics	3	1	0	30	20	50	100	4
4	MAT2107	Mathematics	Advanced Engineering Mathematics	3	1	0	30	20	50	100	4
5	MME2104	MME	Introduction to Physical Metallurgy Lab	0	0	3	0	30	20	50	2
6	MME2105	MME	Mineral Dressing Lab	0	0	3	0	30	20	50	2
7	MME2106	MME	Introduction to materials Science Lab	0	0	3	0	30	20	50	2
8	HSS2102	Humanities	Humanities & Social Sciences	1	0	0	0	15	10	25	1
9	PFD2103	Humanities	Professional Development	2	0	0	0	30	20	50	2
			TOTAL	**15**	**4**	**9**	**120**	**215**	**290**	**625**	**25**

* End Semester Examination
** Progress Review Examination

MME: Metallurgical and Materials Engineering

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SEMESTER III

Code	Subject	Credit Structure			
		L	T	P	C
MME2101	Introduction to Physical Metallurgy	3	1	-	4
MME2102	Mineral Dressing	3	1	-	4
MME2103	Metallurgical Thermodynamics and Kinetics	3	1	-	4
MAT2107	Advanced Engineering Mathematics	3	1	-	4
MME2104	Introduction to Physical Metallurgy Lab	-	-	3	2
MME2105	Mineral Dressing Lab	-	-	3	2
MME2106	Introduction to Materials Science Lab	-	-	3	2
HSS2102	Humanities & Social Sciences	1	-	-	1
PFD2103	Professional Development	2	-	-	2
TOTAL		**15**	**4**	**9**	**25**

SEMESTER IV

Code	Subject	Credit Structure			
		L	T	P	C
MAT2212	Numerical Methods & Computing	4	1	-	5
MME2207	Fuels, Furnaces and Refractories	3	1	-	4
MME2208	Deformation Behavior & Testing of Materials	3	1	-	4
MME2209	Principle of Extractive Metallurgy	3	1	-	4
MME2210	Fuels, Furnaces & Refractories Lab	-	-	3	2
MME2211	Deformation Behavior & Testing of Materials Lab	-	-	3	2
MME2212	Non-destructive Testing Lab	-	-	3	2
PFD2204	Professional Development	2	-	-	2
TOTAL		**15**	**4**	**9**	**25**

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Semester: III **Branch: Metallurgical and Materials Engineering**
Subject: Introduction to Physical Metallurgy **Code: MME2101**

Course Description:

This courses Introduction to physical metallurgy is principally aimed to introduce the students about relationships between physical metallurgy, materials science and solid state physics. This course comprises the concept of structure –property correlation, crystal structure, grain size, yield point phenomena, plastic deformation. The slip system for different crystal structures, the solidification processes for pure metals and alloys, imperfection arises during solidification process, the concept of iron–carbon diagram, TTT and CCT diagram and its application, physical metallurgy of some non-ferrous alloys will be discussed.

Course Objectives:

1. At some point of time an engineering problem involved issues related to material selection. The objective of this course is to understand the behavior of materials and structure-property correlation helps to select suitable materials for a particular application;
2. To provide a basic understanding of the underlying principles that determines the evolution of structures in metals and alloys during their processing and its relation with their properties and performances in service;
3. Provide a smooth link between the basic knowledge of science and engineering understanding.

Syllabus:

UNIT- 1:
Crystal systems and Bravais lattices; crystallographic planes and directions, atomic packing in crystals; calculation of packing density; linear and planer density, voids in crystal structures

UNIT- 2
Nucleation and growth, solidification of metals in ingot mould, imperfections in crystals, plastic deformation of metals, yield point phenomena, plastic deformation in polycrystalline metals, critical resolved shear stress, dislocation theory, recovery, recrystallization and grain growth.

UNIT- 3
Factors affecting solid solubility, electron compound, intermediate compound, phase rule, binary phase diagrams: isomorphous, eutectic, peritectic, eutectoid systems, lever rule and its applications, effects of non equilibrium cooling, coring and homogenization.

UNIT- 4
Iron – iron carbide diagrams, TTT diagram, CCT diagram, metallographic inspection of steels and cast irons, influence of alloying elements on iron carbon equilibrium diagram, TTT and CCT diagrams.

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UNIT- 5

Phase diagram of non-ferrous alloy system brass, bronze, Al-Cu and Al-Si phase diagrams

Text Books:

1. Introduction to Physical Metallurgy, Sidney H. Avner, Tata McGrow Hill Publishing Co.
2. Elements of Physical Metallurgy, Lakhtin. MIR Publication, Moscow.
3. Material Science & Engineering, W. D. CalisterJr., Willy India Pvt. Ltd.
4. Physical Metallurgy, Vijendra Singh, SPD, Pvt. Ltd.

Reference Books:

1. Principles of Physical Metallurgy, Robert Reed Hill, East-West publication
2. Material Science & Engineering, W. F. Smith & Javed Hashemi, Ravi Prakash, Tata McGrow Hill.
3. Phase Transformation in Metals and Alloys: David A. Porter, Kenneth E. Easterling and Mohamed Y. Sherif, CRC Press.

Course Outcome:

The course of Introduction to Physical Metallurgy will help the student to understand the crystal structure, behavior of materials, and trains them to understand the kinetics of phase transformation. The properties of materials and their applications based on the properties defects in metallic system and make them to understand about structure-properties correlation of materials. This course also gives the concept of relationships between physical metallurgy, materials science and solid state physics.

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Semester: III **Branch: Metallurgical and Materials Engineering**
Subject: Mineral Dressing **Code: MME2102**

Course Description:

Mineral Dressing is a key engineering discipline, which combines knowledge of chemistry, mathematics with physical principles and real world economic considerations. The scale of operation varies from small to very large, and a principal feature is the translation of laboratory-scale results to large-scale production.

This course involves the science and technology of adding value to raw mined products through the extraction of valuable minerals and their subsequent conversion into products. The application of process principles of minerals processing operations includes ore preparation, pre-blending, size reduction, separation and concentration, sorting, flotation, hydrometallurgy, pyro-metallurgy and electrometallurgy.

Objectives:

1. To familiarize the students with fundamentals of minerals;
2. To understand the distribution of minerals deposits in different forms;
3. To understand the basics of mineral beneficiation;
4. To understand the physical and chemical properties of different ores and minerals;
5. To understand the process parameters and their details for utilization;
6. To understand the application techniques in metal extraction processes;
7. To upgrade the low grade ore by beneficiation methods;
8. To provide opportunity of self-evaluation on the understanding of the subject matter;
9. Able to operate as effective engineers or scientists in materials industries, academia, or related fields with respect to advanced level equipment;

Syllabus:

UNIT- 1
Different types of rocks and their basic characteristics, nature and types of ore deposits, chemical properties of minerals. metallic and non-metallic minerals- emphasis on its properties and industrial uses, distribution and utilization of minerals including coal and petroleum deposits of India.

UNIT- 2
Theories of comminution, open and closed circuit grinding, laws of crushing and grinding, laboratory sizing and reporting the data. sedimentation, and elutriation, jaw and gyratory crushers; roll crusher and their performances, , ball mills, tube mill, pot mill – structure, working principle, efficiency.

UNIT- 3
Energy relationship and work index; types of screens; screen analysis; factors affecting performance of screens; Classification- sizing and sorting classifiers. jigging cycle, jigging processes, magnetic and electrostatic separation- principles, and operations processes.

UNIT- 4
Movement of solids in fluids; Stoke's law and Newton's law; terminal velocity, free and

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hindered settling ratio; ratio of concentration; recovery; selectivity index. Classification-principle, concept of drag force, operational process of different types of classifiers.

UNIT- 5

Flotation- principal, requirements, physical and chemical aspects, role of flotation and flocculation agents, types and significance of contact angle of the bubbles, application of flotation to concentration of important.

Text Books:

1. Text book of Engineering Geology: Prabir Singh, Katson Educational Series.
2. Mineral Processing Technology, B.A. Wills, T.J. Napier-Munn, Pub: Elsevier Science & Technology Books, 7th Edition, 2009.
3. Mineral Beneficiation: A Concise Basic Course, D.V. Subba Rao, Pub.: CRC Press, 2011.
4. Introduction to Mineral Processing, E.G. Kelly and D.J. Spottiswood, Pub.: Wiley, 1982.
5. Principles of Mineral Processing, M.C. Fuerstenau, Pub.: Society of Mining, Metallurgy and Exploration, 2003.

Reference Books:

1. Principles of Mineral Dressing: A. M. Gaudin, Tata McGraw Hill Edition.
2. A Text Book of Geology: P. K. Mukherjee, the World Press Private Limited.
3. S. K. Jain, Ore Processing, Oxford- IBH Publishing Company, 2005.

Course Outcome:

1. Students will be able to understand the characteristics of different ores and minerals;
2. Students will be familiar with the different ore dressing processes utilized in industrial practices;
3. The students will be able to use the techniques, skills, and modern engineering tools necessary for industrial practices;
4. Students will be able work effectively as an individual and as a member of a multidisciplinary team.

Semester: III **Branch: Metallurgical and Materials Engineering**
Subject: Metallurgical Thermodynamics and Kinetics **Code: MME2103**

Course Description:

This course deals with the understanding of different laws of thermodynamics and will provide deep understanding of the basic principles of thermodynamics and kinetics which is must for understanding of any metallurgical processes involving chemical reactions and physical changes at high temperature.

Course Objectives:

1. To understand various thermo-dynamical concepts;
2. To understand the concept of thermodynamics and kinetics;
3. To understand the various chemical reactions occurring in metallurgical processes;
4. To understand the various physical changes in materials at high temperatures.

Syllabus:

UNIT- 1
Importance of thermodynamics, laws of thermodynamics, definition of thermodynamic terms, concept of system, states and equilibrium, types of system, extensive and intensive properties, homogeneous and heterogeneous systems, quasistatic process, Zeroth law of thermodynamics.

UNIT- 2
Internal energy, heat capacity, specific heat and latent heat, enthalpy, isothermal and adiabatic processes, state properties, heat of reaction, heat of formation, Kirchoff's law, Sievert's law-residual gases in steel.

UNIT- 3
Entropy of irreversible processes, Maxwell's relations, Clausius-Clapeyron equation, Gibb's-Helmholtz relations. Gibb's-Duhem equation, partial molar properties of mixing, ideal solution, Raoult's law, Henry's law, non-ideal solution.

UNIT- 4
Temperature dependence of entropy, stastical interpretation of entropy, Relation between Cp and Cv, Nernst heat theorem, equilibrium constant, Van-Hoff equation, concept of fugacity, activity and mole fraction.

UNIT- 5
Ellingham diagram in detail for metal oxides, activity, gas phase reactions, reaction kinetics: homogeneous and heterogeneous reactions, diffusion in gases, adhesion, metastable products and partial equilibrium. melting and solidification, precipitation, eutectoid, massive, spinodal, martensitic and order disorder transformations.

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Text Books:

1. Introduction to Thermodynamics of Materials, D.R Gaskell, Taylor and Francis, 2003.
2. Metallurgical Thermodynamics Kinetics and Numerical, Dr. S.K.Dutta and Prof A B Lele published by S.Chand.
3. Introduction to Metallurgical Thermodynamics, D.R. Gaskel published by McGraw Hill, NY.
4. Introduction to Materials and Metallurgical Thermodynamics by A. Ghosh published, PHI Pub.
5. Problems in Metallurgical Thermodynamics and Kinetics by G. S. Upadhyaya and R. K. Dube, Pergamon Press.

Reference Books:

1. Advanced Thermodynamics for Engineers, Kenneth Wark Jt.m, McGrew Hill Inc., 1995.
2. Advanced Engineering Thermodynamics, Bejan, A., John Wiley and Cons, 1988.
3. Thermodynamics, Fourth Edition, Holman, J.P., McGraw Hill Inc., 1988.
4. Introduction to Thermodynamics, Classical Sonntag, R.E., and Van Wylen.G,
5. Statistical Thermodynamics, Third Edition, John Wiley and Sons, 1991.

Course Outcome:

After completion of the course, students will be able to know or expected to do:-

1. Explain concepts and laws of thermodynamics;
2. Derive different thermodynamic relations and solve problems;
3. Comprehend the concept and applications of energy, entropy and energy;
4. Interpret Ellingham Diagram for oxides.

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Semester: III **Branch: Metallurgical and Materials Engineering**
Subject: Advanced Engineering Mathematics **Code: MAT2107**

Course Description:

When the real numbers are replaced by the complex numbers in the definition of the derivative of a function, the resulting (complex-)differentiable functions turn out to have many remarkable properties not enjoyed by their real analogues. This course provides an introduction to complex analysis which is the theory of complex functions of a complex variable. We will start by introducing the complex plane, along with the algebra and geometry of complex numbers, and then we will make our way via differentiation, integration, complex dynamics, power series representation and Laurent series into territories at the edge of what is known today. The Laplace and Fourier Transforms aim to take a differential equation in a function f and turn it into an algebraic equation involving its transform $\bar{f}$ or $\hat{f}$. Such an equation can then be solved by algebraic manipulation, and the original solution determined by recognizing its transform or applying various inversion methods.

Course Objective:

The primary objective of Advanced Engineering Mathematics III is to prepare students for subsequent work for their future careers in Metallurgical engineering. Since there are students studied with Applied Math-I, Applied Math-II, the course will provide an extension of those courses. This means that much of the material covered may be application of previous semester or repetition for those who took strong mathematics. The objective of this course is

1. To develop an ability to conceptualize, inquire, reason and communicate mathematically and to use the mathematical concepts of Probability Distributions to formulate and solve the real life problems;
2. To make students proficient in Calculus Computations involving functions of a complex variable;
3. To make students familiar with the important integral transform techniques for analyzing and describing the behavior of the functions.

Syllabus:

UNIT- 1
Functions of a complex variable, Limits, continuity and differentiability of functions of complex variables, Cauchy-Riemann equations, Analytic functions, Harmonic functions, Application to fluid flow problems, Complex integration, Cauchy theorem, Morrera's theorem and Cauchy integral formula.

UNIT- 2
Expansion in Taylor's and Laurent's series, Singularities and their classifications, Residues, Cauchy-Residue's theorem and Contour Integration.

UNIT- 3
Laplace Transform, Definition & Existence, Transform of elementary functions, Properties of Laplace transform, Transform of derivatives & integrals, Multiplication by tn, Division by

t, Evaluation of integrals, Inverse Laplace Transform, Convolution theorem, Unit step function, Unit impulse function, Periodic functions, Application to solution of ordinary differential equations.

UNIT- 4
Fourier Integrals and Fourier Transform, Definition, Properties of Fourier transform, Inverse Fourier transform, Fourier sine and cosine transforms, Application of Fourier transform to solution of ordinary differential equations.

UNIT- 5
Random variables, Expectation, Mean, Standard Deviation of Discrete & Continuous Random Variables, Probability Distributions, Discrete & Continuous Probability Distributions, Binomial, Poisson and Normal distributions.

Text Books

1. Higher Engineering Mathematics by B.S. Grewal (38th edition), Khanna Publishers.
2. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, Narosa Publishing House.

Reference Books:

1. Advanced Engineering. Mathematics, Erwin Kreyszig (8th edition), John Wiley & Sons.
2. Advance Engineering Mathematics, R. R. Greenberg, Pearson Publication.
3. Higher Engineering Mathematics, B. V. Rammana, Tata Mc Graw Hill.
4. Engineering Mathematics Volumes-I & II, S. S. Sastry-PHI Publication.

Course Outcome:

Upon completion of this course, students will be able to:

1. Differentiate and Integrate functions of a complex variable;
2. Represent a function of a complex variable as an infinite sum of terms that are calculated from the values of the function's derivatives at a single point;
3. Be confident in the use of complex variable theory and apply contour integration to solve improper integrals;
4. Students will gain a range of techniques employing the Laplace and Fourier Transforms in the solution of ordinary and partial differential equations;
5. Use the mathematical concepts of Discrete and Continuous Probability Distributions to formulate and solve the real life problems.

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Semester: III **Branch: Metallurgical and Materials Engineering**
Subject: Introduction to Physical Metallurgy Lab **Code: MME2104**

Objectives:

1. Fully qualified as entry-level metallurgical and materials engineers, with an ability to adopt and progress in a rapidly changing field;
2. Well-rounded individuals who both understand the principles and can undertake the practice of the metallic materials of engineering materials;
3. Able to operate as effective engineers or scientists in metallurgical and materials industries or related fields.

Syllabus:

(At least six experiments are to be performed by each student)

1. Study the process of hot mounting and cold mounting.
2. Prepare the metallic samples for metallographic examination.
3. Study the microstructure of various steel samples.
4. Study the microstructures of brass and bronze.
5. Study the metallurgical microscope and its components.
6. Study the etching process and etching reagents.
7. Study the microstructures of pure metals.
8. Study the ASTM method for grain size Measurements.
9. Study the effect of cold working on microstructure.
10. Study the microstructures of annealed and normalized steels.

Reference Source:

1. The Principles of Metallographic Laboratory Practice by George L. Khel.
2. Hand Book of Metallography and Microstructure, ASM Handbook, Vol. 9.
3. Introduction to Physical Metallurgy, Sidney H. Avner.
4. Material Science by S P Gupta.

Course Outcome:

1. Conduct and analyze internal characteristics of metals and alloys.
2. Able to know the concept of grain size and related mechanical properties correlation;
3. Perform the problems through experiments and reach a solution related to a specified metal or alloy;
4. Provide continuing professional development and self learning.

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Semester: III **Branch: Metallurgical and Materials Engineering**
Subject: Mineral Dressing Lab **Code: MME2105**

Objectives:

1. Fully qualified as entry-level metallurgical and materials engineers, with an ability to adapt and progress in a rapidly changing field;
2. Well-rounded individuals who both understand the principles and can undertake the practice of the mineral dressing of engineering materials;
3. Able to operate as effective engineers or scientists in metallurgical and materials industries or related fields.

Syllabus:

(At least six experiments are to be performed by each student)

1. Petro graphic description of igneous, metamorphic and sedimentary rocks.
2. Crushing the ore using Jaw crusher
3. Crushing the ore using Roll crusher
4. Study of Rod mill.
5. Grinding the ore using Ball mill.
6. Grinding of ore using Pot mill.
7. Laboratory Sizing and Sieve analysis.
8. Study the Jigging process.
9. Study the Akin's Classifier.
10. Concentration ore by Froth Flotation Cell.

Reference Source:

1. Introduction to mineral processing, Kelly E.G., Spottiswood, D., J.,
2. Mineral Processing Technology, Wills, B.A.,

Course Outcome:

1. Conduct and analyze minerals' size reduction;
2. Select and redesign a problem;
3. Perform the problem through experiments and reach the sustainable solution related to a specified mineral or ore;
4. Provide continuing professional development and self learning.

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Semester: III **Branch: Metallurgical and Materials Engineering**
Subject: Introduction to Material Science Lab **Code: MME2106**

Objectives:

1. Fully qualified as entry-level materials engineers, with an ability to adapt and progress in a rapidly changing field;
2. Well-rounded individuals who both understand the principles and can undertake the practice of the science and engineering of materials;
3. Able to operate as effective engineers or scientists in materials industries, academia, or related fields.

Syllabus:

(At least six experiments are to be performed by each student)

1. Study the crystal structure materials.
2. To find the Band Gap of semiconductor using Four Probe method.
3. Electrical conductivity of materials.
4. To study the hysteresis loss by tracing a BH curve.
5. To measure the Hall co-efficient by Hall Effect apparatus.
6. Synthesis of composite materials
7. To find the apparent porosity of a ceramic materials.
8. Study the volume loss using wear testing methods.
9. Casting and microstructure study of alloys.
10. To study luminescence methods.

Reference Source:

1. Material Science and Engineering, An Introduction, W.D. Callister, John Wiley And Sons (SEA) Pte Ltd, Singapore, 1994.
2. Physical Metallurgy Principles, R.E. Reed - Hill and R. Abbaschian, PWS Kent
3. Publishing Co., Boston, USA, 1992).
4. Metals Handbook, ASM Desk Edition, Eds: H.E. Boyer and T.L. Gall, ASM, Metals Park, OH, USA, Vol. 2, 1985.
5. Metals Handbook: Metallography and Microstructure, Vol. 9, 9th Edition, ASM, Metals Park, OH, USA, 1985.
6. Metallography Laboratory Manual, M.N.A. Hawlader, 1984.
7. Physical Metallurgy for Engineers, D.S. Clark and W.R. Varne, Van Nostrand, 1962.
8. The Principles of Metallographic Laboratory Practice, G.L. Kehl, McGraw Hill, 1949.

Course Outcome:

1. Conduct and analyze a materials' property;
2. Select and redesign a problem;
3. Perform of the problem through experiments to reach the sustainable solution;
4. Provide continuing professional development and self learning.

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Semester: III **Branch Metallurgical and Materials Engineering**
Subject: Humanities & Social Sciences **Code: HSS2102**

Course Description:

The society places a great deal of responsibility on its professionals and requires that they conduct themselves in a manner fitting to the place of prominence accorded to them by the community. Studying and understanding professional ethics is a part of students' development as an engineer.
This course is designed to introduce undergraduate engineering students to the concepts, theory and practice of engineering ethics. It will allow students to explore the relationship between ethics and engineering and apply classical moral theory and decision making to engineering issues encountered in academic and professional careers.

Course Objectives:

The objectives of this course are to provide students of engineering with:

1. An understanding of their duties and responsibilities as professionals through gaining knowledge of the philosophies of ethics, professional practice, and world culture.
2. Basic knowledge to make informed ethical decisions when confronted with problems in the working environment.
3. An understanding of how a societal moral varies with culture and how this influences ethical thought and action.
4. Know some of the classic cases as well as contemporary issues in engineering ethics.

Syllabus:

UNIT- 1
Engineering Ethics
Introduction To Ethics, Comparison Of Ethics And Engineering Ethics, Ethics At Personal Level – Variety Of Moral Issues And Moral Dilemmas, Kohlberg's Theory, Gilligan's Theory.

UNIT- 2
Importance of Ethics And Professionalism
The importance of ethics in science and engineering, The role of codes of ethics, Professions and Professionalism, Professional responsibilities of engineers.

UNIT- 3
Engineer's Responsibility for Safety
Safety and Risk – Assessment of Safety and Risk, Risk Benefit Analysis, Reducing Risk – Risk management.

UNIT- 4
Engineer's Responsibilities and Rights
Loyalty – Respect for Authority, Confidentiality, Conflicts of Interest; Professional Rights, Plagiarism and Intellectual Property Rights (IPR).

UNIT– 5

Global Issues

Globalization and international concern, Multinational Corporations and ethical issues, Engineers as Expert Witnesses and Advisors, Sample Code of Conduct.

Text Books:

1. Ethics in Engineering, Mike Martin and Roland Schinzinger, McGraw Hill, New York, 2005.
2. Engineering Ethics – Concepts and Cases,Charles E Harris, Michael S Pritchard and Michael J Rabins, Thompson Learning, 2000.
3. Fundamental of Ethics for Scientists and Engineers, Seebauer, E.G. and Barry, R.L New York: Oxford University Press, 2001.

Reference Books:

1. Engineering Ethics, Charles D Fleddermann, Prentice Hall, New Mexico, 1999.
2. Ethics and the Conduct of Business, John R Boatright, Pearson Education, 2003.
3. Fundamentals of Ethics for Scientists and Engineers, Edmund G Seebauer and Robert L Barry, Oxford University Press, 2001.
4. Business Ethics – An Indian Perspective, Prof. (Col) P S Bajaj and Dr. Raj Agrawal Biztantra, New Delhi, 2004.
5. Computers, Ethics and Society, David Ermann and Michele S Shauf, Oxford University Press, (2003)

Course Outcomes:

After completion of the course, students will be able to:

1. Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field;
2. Assess their own ethical values and the social context of problems;
3. Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects;
4. Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work;
5. Demonstrate knowledge of a professional code of ethics;
6. Demonstrate ethical practice.

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Semester: III **Branch: Metallurgical and Materials Engineering**
Subject: Professional Development **Code: PFD2103**

Course Description:

Information is crucial to an organization and when this information is communicated in writing, the quality of such communications can have a significant impact on business performance and decision making. Effective business writing is concise, accurate, unambiguous, logical and easily understood.

This Professional Development (Business Writing Skills) course teaches the best practices students must know to be able to write clear, effective, professional business documents. This course will help students to develop the skills necessary for successful business writing – be it reports, emails, letters, faxes, policy documents or contracts.

Course Objectives:

1. The objectives of this course are:
2. To make students conversant with the basic forms, formats and techniques of business writing;
3. To familiarize learners with the mechanics of writing;
4. To enable learners to write in English precisely and effectively
5. To helps students, communicate effectively, appropriately and clearly in all situations

Syllabus:

UNIT- 1
Communication in Business

Business Communication-functions and principles of communication (7C's of communication), Types of Communication, Context of communication, Medium of communication, Barriers to communication.

UNIT– 2
Elements of Business Writing

Business letter -principles of business writing; Elements of letter writing and styles of writing, Resume, covering letter, Grammar in Use.

UNIT– 3
Business Correspondence

Business letters - circulars, e-mails, agendas, minutes, sales letter, enquiries, orders, Letters of complaint- claims and adjustments, Notice, Quotation and Tenders.

UNIT- 4
Business Proposals and Reports

Project proposals- characteristics and structure, Project reports – types- characteristics – structure, Process and mechanics of report writing- visual aids- abstract - executive summary- recommendation Writing- definition of terms.

UNIT- 5

Effective Communication

Communication in organization, different kinds of texts for different purposes, reading between the lines. Comprehension of Unseen Passages, Précis writing.

Text Books:

1. Business Communication, Raman, Meenakhshi, and Prakash Singh, O U P, New Delhi, 2008.
2. Basic Business Communication, Lesikar, Raymond V., John D Pettit, and Mary E FlatlyLesikar's, 10th ed. Tata McGraw-Hill, New Delhi, 2007.
3. Technical Writing: Process and Product, Gerson, Sharan J., and Steven M Gerson, Pearson Education, New Delhi, 2008.
4. Effective Business Communication, Murphy, Herta, Herbert W Hildebrandt, and Jane P Thomas, 7th ed. Tata McGraw-Hill, New Delhi.
5. Business Communication Today, Bovee, Courtland and John V Thill, 8th ed. Pearson Education, New Delhi, 2008.

Reference Books:

1. Integrated Business Communication in a Global Market Place Stuart Bonne E.,
2. Marilyn S Sarow and Laurence Stuart, .3rd ed. John Wiley India, New Delhi, 2007.
3. Business Communication: Process and Product,Guffey, Mary Ellen., 3rd ed. Thomson and South-western, 2004.
4. Introduction to Communication Studies, Fiske, John Rotledge London, 1990. A Communicative Grammar of English, Geoffrey Leech & Jan Svartvik, ELBS Longman, England.
5. The Skills of Communicating, Bill Scott –Jaico Publishing House, Mumbai, 2004.
6. Model Business Letters, Gartside L- Pitman, London, 1992.
7. The English Errors of Indian Students by T.L.H. Smith-Pearse, I.E.S., Oxford University Press, Madras- Latest Edition.
8. Grammar and Composition by P.R. Sarkar, Anand Marg Publications, Kolkata

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Communicate effectively by analyzing audience, organizing documents, writing clearly and precisely with no grammar errors and presenting the document with skillful design;
2. Demonstrate the use of basic and advanced proper writing techniques;
3. Write informal and formal reports;
4. Identify barriers to effective communication and how to overcome them.;
5. Write e-mail effectively and efficiently.

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