MUZAFFARPUR INSTITUTE OF TECHNOLOGY, MUZAFFARPUR

COURSE FILE

OF

Material Science

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Department of Mechanical Engineering

Vision

- To strengthen the region through imparting superior quality technical education and research; which enables the fulfillment of industrial challenge and establish itself as a Centre of Excellence in the field of Mechanical Engineering.

Mission

- To build an academic environment of teaching and lifelong learning for students to make them competitive in context with advance technological, economical and ecological changes.
- To enable the students to enhance their technical skills and communications through research, innovation and consultancy projects.
- To share and explore the accomplishments through didactic, enlightenment, R & D programs with technical institution in India and abroad.

Mechanical Engineering Program Educational Objectives

After 4 year of graduation a B.TECH (ME) graduate would be able to

- Graduates will spread and enhance their technical capability and proficiency through vital domain of economical, environmental and social concerns affiliated with the mankind and industry.

- Graduates will able to work professionally with modern methods in the area of Thermal, Mechanical System Design, Manufacturing, Measurement, Quality control and other interdisciplinary fields of concerns.

- Graduates will practice Mechanical engineering in sensible, flexible and ethical manner to benefit the society, industry and nation toward the rapidly changing global technical standards.

- Graduates will serve as ambassadors for engineering by their knowledge, creativity, imagination and innovation and set new extremes in their profession through lifelong learning.

Mechanical Engineering Student Outcomes

Students who complete the B.TECH degree in ME will be able to:

1. An ability to apply the knowledge of mathematics, basic sciences and engineering concepts to solve the complex engineering problems.
2. The ability to conduct experiments and to critically analyze and interpret the experimental data to reach at substantial outcomes.
3. An ability to design systems, components, or processes to meet appropriate needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. An ability to identify, formulates, and solves the complex engineering problems.
5. An ability to function on multi-disciplinary teams that leads the multi-disciplinary projects.
6. An understanding of professional and ethical responsibility.

7. An ability to communicate effectively with written, oral, and visual means.
8. An ability to understand the impact of engineering solutions in a global, environmental, economical and societal context.
9. An ability to recognize the need to engage in life-long learning.
10. An ability to attain knowledge of contemporary issues.
11. An ability to use the techniques, skills, and modern tools necessary for Mechanical engineering practice.
12. Possess ability to estimate costs, estimate quantities and evaluate materials for design and manufacturing purposes.

Course Description Form Academic Year: 2018-2019

Subject Title	Materials Science	**Credit Value :** 4
Subject Code	02 1305 L: T: P -3-1-0	**Hours/Week : 4**
Pre-requisite/ Co-requisite/ Exclusion	**Basic knowledge of Physics, Chemistry and Mathematics.**	
Objectives	1) To realize the impact of the development of engineering materials on human civilization; 2) To enable students to establish a broad knowledge base on the structure and properties of materials for solving engineering problems. 3) To enable students to understand the applications and selection of engineering materials based on the consideration of properties, cost, ease of manufacture, environmental issues and their in service performance. 4) To understand the phase diagrams those are important to design and control of heat treating process and to obtain desirable microstructures. 5) Develop intuitive understanding of the subject to present a wealth of real world engineering examples to give students a feel of how material science is useful in engineering practices.	
Intended Learning Outcomes	**Upon completion of the subject, students will be able to:** 1. comprehend the importance of materials in engineering and society; 2. apply the knowledge of materials science to analyze and solve basic engineering problems related to stress, strain and fracture of materials; 3. Select appropriate materials for various engineering applications taking into consideration of issues in cost, quality and environmental concerns.	
Contribution of the Subject to the Attainment of the Programme Outcomes	**Programme Outcomes:** Category A: Professional/academic knowledge and skills Programme Outcomes 1 and 3.	
Subject Synopsis/ Indicative Syllabus	**Keyword Syllabus:** 1. Classification and application of engineering materials, recent development in metallic material – cermets. 2. Phase rule, phase diagram, binary system, binary eutectic systems, eutectoid and peritectic reaction, The iron carbon system, the iron – iron carbide phase diagram. 3. Phase transformation in metals – Isothermal transformation diagrams (or Time-Temperature-Transformation plots), Martensite, Continuous cooling transformation diagram – annealing, Normalizing, Tempered Martensite. 4. Cast iron – grey cast iron, ductile (nodular) cast iron, white cast iron, malleable cast iron. 5. Composite materials – Influence of fiber orientation and concentration, Continuous and aligned fiber composites, Tensile stress – strain behaviour – Longitudinal loading, Elastic behaviour – Longitudinal loading, Elastic behaviour – Transverse loading, Whiskers, Glass fiber – reinforced polymer (GFRP) composites.	

Teaching/Learning Methodology	The subject will be delivered mainly through lectures but tutorials, case studies and power point presentation will substantially supplement
Course Outcomes(COs) : At the end of the course, the student will be able to	

CO No.	Course Outcomes	Bloom's taxonomy	Bloom's Level
CO-1	***Analyze*** the Structure of materials at different levels, basic concepts of crystalline materials like unit cell, FCC, BCC, HCP, APF (Atomic Packing Factor), Co-ordination Number etc.	Analyzing	L4
CO-2	***Understand*** concept of mechanical behavior of materials and calculations of same using appropriate equations	Understanding	L2
CO-3	***Explain*** the concept of phase & phase diagram & ***understand*** the basic terminologies associated with metallurgy. Construction and ***identification*** of phase diagrams and reactions	Understanding, Identify	L4
CO-4	***Understand*** and *suggest* the heat treatment process & types. Significance of properties Vs microstructure. Surface hardening & its types. Introduce the concept of hardenability & demonstrate the test used to find hardenability of steels	Understanding, Evaluating	L4, L2
CO-5	***Explain*** features, ***classification,*** *applications* of newer class materials like smart materials, piezoelectric materials, biomaterials, composite materials etc.	Explain, Apply, Classify	L3, L4

Activities planned for achievement of outcomes:

Activities to be selected from following list (Partial list, more activities can be added)	Tick mark
1. Assignments	√
2. Quizzes	√
3. Internal Assessment Tests	√
4. Course Seminar	√
5. Course Project (Mini project)	√
6. Viva-Voce	√

Mapping of COs and POs

Course Outcomes	Activities (Mention the S.No.)	Program Outcomes											
		1	2	3	4	5	6	7	8	9	10	11	12
CO-1	1,2												
CO-2	3												
CO-3	-												
CO-4	4												
CO-5	-												

Assessment Methods in Alignment with Intended Learning Outcomes

Evaluation and Examination Blue Print:

Internal assessment is done through quiz tests, presentations, and assignments work. Two sets of question papers are asked from each faculty and out of these two, without the knowledge of faculty, one question paper is chosen for the concerned examination. The components of evaluations along with their weightage followed by the University is given below

Sessional Test 20%

Internals 10%

End term examination 70%

Specific assessment methods/tasks	**% weighting**	**Intended subject learning outcomes to be assessed (Please tick as appropriate)**		
		1	**2**	**3**
Assignments	10%	√	√	√
Sessional Test	20%		√	√
End term examination	70%		√	√

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The assignments are designed to reflect students' understanding of the subject and to assist them in self-monitoring of their progress.

The test and examination are for determining students' understanding of key concepts as well as for assessing their achievement of the learning outcomes.

Student Study Effort Expected

Class contact:

Lectures, tutorials	**50** Hours
Other student study effort:	
Guided reading, assignments and reports	**25** Hours
Self-study and preparation for test and examination	55 Hours
Total student study effort:	**130**

Reading List and References	**Reference Books:** 1. William D. Callister, Jr., David G. Rethwisch, *Fundamentals of materials science and engineering: an integrated approach,* John Wiley & Sons; c2008. **2. http://home.iitk.ac.in/ãnandh/E-book.htm** **3**. V. Raghavan, Materials Science and Engineering,5thEdition, Prentice Hall, India, 2007
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