



प्रतिष्ठित संस्थान  
INSTITUTION OF EMINENCE

राष्ट्रीय अपेक्षाएँ, वैश्विक मानक  
National Needs, Global Standards

हैदराबाद विश्वविद्यालय  
UNIVERSITY OF HYDERABAD

**Integrated M.Tech.  
(Materials Engineering)**

**w.e.f 2024-25**

**School of Engineering Sciences and Technology**



**हैदराबाद विश्वविद्यालय  
University of Hyderabad**

## **Brief Notes on I.M.Tech. (Materials Engineering)**

The Integrated M.Tech. in Materials Engineering (in short, I.MTech. (Materials Engineering)) will be offered for the students who have completed 10+2 (MPC or MBiPC) as per the AICTE rules and in line with the National Education Policy (NEP) 2020, Govt. of India and 7, 8 and 9 Sustainable Development Goals of the United Nations. I.M.Tech. (Materials Engineering) will be a ten-semester program with an option to exit after four years (8 semesters) with B.Tech. (Materials Engineering) or B.Tech. (Materials Engineering) (Honors). The program is intended for in-depth teaching and training strictly on the design and selection principles of Materials Engineering at different length scales. Additionally, general principles of Engineering and Sustainability will be taught and practiced in the program. Several advanced elective courses will be offered to train the students to cater to the future demands of society. Courses related to scientific communication, human values and ethics, research methodology, managerial skills, entrepreneurship, etc., will also be a part of the program to give overall training to the students. Moreover, some selected subjects will be in the modular form, facilitating the experts from industries and research labs, academicians from within and outside India, etc., to be involved in the teaching and training. In the case of training related to industry-relevant equipment, short industrial training camps will be arranged, and several virtual labs will be included in the program to facilitate the students to “learning by doing”. The fifth year (i.e., ninth and tenth semesters) will be dedicated to a fundamental or applied research project in the School or outside the University so that the work fetches them appropriate placements. All the students will be doing mini-projects during the 7<sup>th</sup> semester, and those who wish to exit at the end of the fourth year will do a major project in the 8<sup>th</sup> semester. The students who do not want to exit at the end of the fourth year will do Preparatory Work (with credits) related to the final year project during the 8<sup>th</sup> semester, implying that the I.M.Tech. projects will be identified during the 7<sup>th</sup> semester. Cross-disciplinary approaches will be adopted to impart knowledge on other related and useful subjects. Suitable electives will be offered, facilitating the students to choose their subjects of interest. The students will also be allowed to take a certain percentage of suitable MOOCs-type courses and secure credits. They will be encouraged to participate in suitable innovation activities and secure credits for the same. More details are given in the following pages.

### **Program Educational Objectives (PEOs)**

PEO1. To attain world-class quality in learning (theory and practical) and research related to engineering sciences and technology.

PEO2. To provide comprehensive and interdisciplinary knowledge on analyses, design, and creation of novel and environmentally benign engineering solutions for short-term and long-term pertinent societal problems.

PEO3. To give comprehensive hands-on training in the theory and experiments related to processing, characterization, and testing of advanced materials and engineering components.

PEO4. To produce high quality and industrially relevant human resource for possible employment in industries, and academic and research organizations.

### **Program Outcomes (POs)**

On completion of the I.M.Tech. (Materials Engineering & Sustainability) at the School of Engineering Sciences and Technology, the students will be able to:

PO-1. apply the basic science and engineering knowledge and course-specific engineering fundamentals to solve the problems in society

PO-2. identify or formulate complex engineering problems and design specific and generic solutions for the same

PO-3. analyze the identified (or formulated) problems and conduct systematic and interdisciplinary research to solve them and/or to provide valid conclusions

PO-4. select and apply appropriate resources and contemporary techniques and tools while solving the identified (or formulated) problems with a complete understanding of the limitations

PO-5. illustrate the complete cognizance of public health and safety, environmental safety, and cultural, societal and legal implications while solving the identified (or formulated) problems

PO-6. evaluate the sustainability, impact and implications of their work on solving the identified (or formulated) problems

PO-7. summarize effectively and explain the identified (or formulated) problems and their solutions and the methodology followed to solve the problems to the appropriate professional community as well as to the general public

PO-8. perform effectively as an individual and as a member (or a leader) of a team under interdisciplinary national and international contexts.

PO-9. apply the project management skills under inter-disciplinary scenarios

PO-10. demonstrate professional responsibility and ethics

PO-11. recognize the need to develop interest in life-long learning to keep-up with the contemporary science and engineering

PO-12. To impart approaches in general problem solving, professional and ethical values, principles of team work and written and oral communication skills

PO-13. To provide an environment that fosters the culture of life-long learning

## **Program Specific Outcomes (PSOs)**

PSO-1 demonstrate comprehensive knowledge of designing and selecting materials for various applications

PSO-2 apply knowledge on sustainable materials processing strategies and solutions

PSO-3 conduct systematic, independent, and sustainable research to produce new engineering materials and products

PSO-4 innovate in Materials Engineering and have entrepreneurial skills

PSO-5 understand, practice, and communicate sustainable materials engineering (especially Reduce, Reuse, and Recycle technologies)

### **What is the need to start I.M.Tech. (Materials Engineering)?**

One of the primary targets of the "Make in India" initiative by the Government of India is significantly improving 25 economic sectors, mostly involving Engineering and Technology. The planned improvement involves job creation and skill enhancement on a big scale. It may be noted that most of these economic sectors need skilled Materials Engineers. The stringent requirements for these engineers to be ready for high-skilled employment, conducting path-breaking research, and innovation and entrepreneurship are their academic and practical training in contemporary and sustainable Materials Engineering and systematic training to innovate in this field. On the other hand, with the leverage and academic autonomy offered by NEP 2020, innovative teaching and training are possible in contemporary Materials Engineering and allied subjects for local and global needs. Moreover, Hyderabad, with various relevant Govt. institutions, Research labs, industries, and entrepreneurial ecosystems, is probably the best place to nurture skilled Materials Engineers to develop various sectors in India. To meet the huge demand for Materials Engineers, considering the successful run of "Make in India" initiative, it is urgently necessary to train many students from an early stage (i.e., immediately after 10+2), which is also the principal mandate of NEP 2020. Therefore, SEST proposes to start a 5-Years Integrated M.Tech. (Materials Engineering & Sustainability) program w.e.f 2024-25. It is also natural for the School of Engineering Sciences and Technology to start an engineering program for undergraduate students. Other aspects supporting starting such a program are: i) no institute offers I. M.Tech. (Materials Engineering) program, ii) starting such a program at the University of Hyderabad is expected to attract a large pool of students, iii) serves one of IoE mandates, iv) this will be an engineering program under NEP 2020, and v) the necessity of sustainable engineering practises as per the UN.

## How is SEST placed to start the proposed program?

In line with the growing demands for Materials Engineers and Engineers in allied areas in India, the School of Engineering Sciences and Technology (SEST) at the University of Hyderabad has been conducting M.Tech. Programs in Materials Engineering, Nano Science and Technology, and Manufacturing Science and Engineering, and Ph.D. Programs in Materials Engineering and Nano Science and Technology with excellence. The placement of alumni and alumnae in excellent positions in various fields, publications' records, and successful execution of various engineering projects having direct societal relevance proves the School's excellence. Moreover, over the years, SEST has created excellent infrastructure (i.e., research equipment, teaching labs, a high-end computational lab, digital classrooms, etc.) that is exclusively practical for teaching and training students in Materials Engineering. SEST established strong and continuing international and national collaborations, works closely with relevant industries, and has research labs, namely ARCI, NFTDC, NFC, etc., as recognized external research centers, making it very easy for the students to avail internships. Such collaborations with industries and research labs also create opportunities for the students to secure good jobs. SEST has well-qualified and highly-motivated faculty covering all areas of Materials Engineering for teaching and conducting research. The full potential of the School can be realized by starting this I.M.Tech. program, which will be pursued by students who have completed 10+2 schooling.

## Details of I.M.Tech. (Materials Engineering)

**Intake:** 60 (As per AICITE)

Stream (Engineering / Architecture)	Program Duration	Quota (HS/AI)	OPEN	OPEN-PwD	EWS	EWS-PwD	OBC-NCL	OBC-NCL-PwD	SC	SC-PwD	ST	ST-PwD	Total
<b>Engineering</b>	<b>5 Years</b>	<b>AI</b>	<b>21</b>	<b>1</b>	<b>6</b>	<b>0</b>	<b>17</b>	<b>1</b>	<b>9</b>	<b>0</b>	<b>5</b>		<b>60</b>

**Eligibility:** (a) As per JOSAA/CSAB guidelines.

One of the criteria for admission is that the candidate should satisfy at least one of these two criteria:

(i) The candidate is within the category-wise top 20 percentile of successful candidates in their respective Class XII (or equivalent) examination of the respective stream and Board.

(ii) The candidate has secured minimum 75% (for GEN or OBC-NCL) or minimum 65 % (for SC, ST or PWD) of aggregate marks in Class XII (or equivalent) examination of the respective stream and Board

(b) Students should have studied Mathematics, Physics and Chemistry (MPC) as compulsory subjects at 10+2 in regular (i.e., CBSE, ICSE, type) schooling; GCE A-level or International Baccalaureate (IB) diploma or IB certificate with Mathematics, Physics and Chemistry (MPC) as compulsory subjects in recognized International schools

(c) Indian students, non-resident Indians, and a specified number of International students as per the appropriate rules and regulations satisfying (b) and other required rules and regulations

**Fees :**

Sl. No.	Institute Code	Institute Name	GEN/OBC-NCL		SC/ST		PwD		Mess Fee Included (Yes / No)
			Day Scholar	Hostellers	Day Scholar	Hostellers	Day Scholar	Hostellers	
1	421	University of Hyderabad	30,190	30,190+ Hoste fee	30,190	30,190+ Hoste fee	5,230	5,230	No

**Admission Process:** Through an appropriate all-India entrance examination or Top 5000 rankers in IIT JEE or the same procedure followed by UoH in the case of other I.M.Tech. programs

According to the recommendations of the NEP Committee of UoH, the exit option will be given to a student who completes a min of 162 credits by the end of 4 years. As per AICTE, the total minimum number of credits for a 4-year program (such as B.Tech.) should be between 150-160 (Approximately 20 credits per semester) as of now. Students who wish to exist at the end of 4 years will be given a B.Tech. (Materials Engineering) (Honors) degree if they complete an additional 20 Credits i.e., a min of 182 credits by the end of 4 years. The students who wish to exist should inform the school by the end of the 6<sup>th</sup> Semester. The students who wish to exist at the end of 8<sup>th</sup> Semester with Honors may earn the extra 20 credits through 5<sup>th</sup> to 8<sup>th</sup> semesters. The credits may be earned by i) completing approved MOOCs-type courses (3 credits or higher), ii) publishing a first author research paper (not presented in any conference) in UGC CARE and SCI journals by the end of 8th semester (10 credits), iii) winning any recognized innovation hacathon (individual - 10 credits; team - 10 credits), and iv) presenting a first author research paper in an approved national conference (3 credits), v) presenting a first author research paper in an approved international conference (6 credits).

The general structure of I.M.Tech. Program will be as follows:

Category	Min Credits (I.M.Tech.) (Regular)	Min Credits (B.Tech. at exit) (Regular)	Min Credits (B.Tech. at exit) (Honors)
Humanities and Social Sciences Courses (HSC)	3	3	3
Basic Sciences Courses (BSC)	15	15	15
Engineering Science Courses (ESC)	30	30	30
Professional Core Courses (PCC)	72	68	68
Professional Elective Courses (PEC)	20	14	14
Open Subjects (OS)	9	9	9
Project work/Internship+seminar	50	20	20
Mandatory Courses (MC)	3	3	3
Additional Credits	X	X	20 + X
<b>Total Credits</b>	<b>202 + X</b>	<b>162 + X</b>	<b>182 + X</b>

**Definition of Credit:** 1 hour lecture per week - 1 credit; 1 hour tutorial per week - 1 credit; 2 hours practical per week - 1 credit; 1 Semester Project Work + related activities - 20 credits

**Universal Human Values 1 will be mandatorily offered for all the students during the induction program as specified by AICTE.**

### 1<sup>st</sup> Year

<b>Semester-I</b>				
Course Title	Credits	Type of Subject (AICTE)	Type of Subject (UoH NEP)	Offering Academic Unit
English	3	HSC	GEC	CELS
Principles of Engineering & Sustainability	4	PCC	DSC/GEC	SEST
Engineering Mathematics - 1	3	BSC	SSC	School of Mathematics & Statistics
Computer Programming and problem solving	3	ESC	Major	SCIS
Computer Programming and problem solving laboratory	2	ESC	Major	SCIS
Engineering Physics - 1	3	BSC	SSC	SEST
IT workshop	2	ESC	SSC	SCIS
<b>Total Credits, Sem-1 = 20</b>				

**Semester-II**

Course Title	Credits	Type of Subject (AICTE)	Type of Subject (UoH NEP)	Offering Academic Unit
Introduction to Materials Engineering	3	PCC	DSC/GEC	SEST
Engineering Mathematics - 2	3	BSC	SSC	School of Mathematics & Statistics
Creativity and Innovation (Modular form)	3	OS	OE	SEST
Materials Laboratory	2	PCC	DSC/GEC	SEST
Engineering Physics - 2	3	BSC	SSC	SEST
Engineering Chemistry	3	BSC	SSC	SEST
Virtual Lab - 1 (Engineering Drawing) (P)	4	ESC	SSC	SEST
<b>Total Credits, Sem-2 = 21</b>		<b>Cumulative Credits at the end of Sem-2 = 41</b>		

P-Practical

**2<sup>nd</sup> Year****Semester-III**

Course Title	Credits	Type of Subject (AICTE)	Type of Subject (UoH NEP)	Offering Academic Unit
Computer Based Numerical Methods + Lab	5	ESC	DSC	SCIS
Engineering Thermodynamics	3	ESC	DSC	SEST
Introduction to Public Health	3	OS	OE	School of Medical Sciences
Electronic Devices & Circuits	3	ESC	DSC	CASEST, School of Physics
Design & Selection of Materials - 1 (Functional Materials)	3	PCC	Major	SEST
Elements of Crystal Structure	3 (2L+1T)	PCC	Major	SEST
<b>Total Credits, Sem-3 = 20</b>		<b>Cumulative Credits at the end of Sem-3 = 61</b>		

**Semester-IV**

Course Title	Credits	Type of Subject (AICTE)	Type of Subject (UoH NEP)	Offering Academic Unit
Kinetics and Diffusion	3	ESC	SSC	SEST
Design & Selection of Materials - 2 (Engineering Materials)	3	PCC	Major	SEST



Crystal Structure Lab (P)	4	PCC	Major	SEST
Elective/MOOCs-1/Innovation activity	4	PEC	ScSE	SEST or Other School/MOOCs/Innovation Club+Mentor
Universal Human Values 2	3	MC	GEC	SEST or Other School
Scientific Communication or related MOOCs-3	3	OS	OE	CELS/Department of English/MOOCs
<b>Total Credits, Sem-4 = 20</b>		<b>Cumulative Credits at the end of Sem-4 = 81</b>		

L-Lecture    T-Tutorial    P-Practical

### 3<sup>rd</sup> Year

<b>Semester-V</b>				
<b>Course Title</b>	<b>Credits</b>	<b>Type of Subject (AICTE)</b>	<b>Type of Subject (UoH NEP)</b>	<b>Offering Academic Unit</b>
Materials Processing -1	4	PCC	Major	SEST
Materials Processing Lab -1 (P)	4	PCC	Major	SEST
Materials Characterization	4	PCC	Major	SEST
Materials Characterization Lab (P)	4	PCC	Major	SEST
Computational Materials Engineering	4	PCC	Major	SEST
<b>Total Credits, Sem-5 = 20</b>		<b>Cumulative Credits at the end of Sem-5 = 101</b>		

<b>Semester-VI</b>				
<b>Course Title</b>	<b>Credits</b>	<b>Type of Subject (AICTE)</b>	<b>Type of Subject (UoH NEP)</b>	<b>Offering Academic Unit</b>
Materials Processing -2	4	PCC	Major	SEST
Materials Processing Lab -2 (P)	4	PCC	Major	SEST
Corrosion Science and Engineering	4	PCC	Major	SEST
Computational Materials Engineering Lab (P)	4	PCC	Major	SEST
Concepts of Nano Science and Technology	4	PEC	ScSE	SEST
<b>Total Credits, Sem-6 = 20</b>		<b>Cumulative Credits at the end of Sem-6 = 121</b>		

P-Practical

**\*\*This year may be used to clear any backlogs\*\***

**\*\*Criterion for promotion to the next semester: 85% of the specified cumulative credits should be secured at the end each semester\*\***

### 4<sup>th</sup> Year

<b>Semester-VII</b>				
Course Title	Credits	Type of Subject (AICTE)	Type of Subject (UoH NEP)	Offering Academic Unit
Research Methodology in Materials Engineering	3	PCC	Major	SEST
Essentials of AI + Lab	5	ESC	DSC	SCIS
Mechanical Behavior of Materials	3	PCC	Major	SEST
Any advanced subject offered in Manufacturing Science and Engineering or Nano Science and Technology	3	PEC	SSC	SEST
Mechanical Testing Lab	4	PCC	Major	SEST
Industrial Management & Entrepreneurship	3	PEC	ScSE	SEST+SMS
<b>Total Credits, Sem-7 = 21</b>		<b>Cumulative Credits at the end of Sem-7 = 142</b>		

<b>Semester-VIII (regular)</b>				
Course Title	Credits	Type of Subject (AICTE)	Type of Subject (UoH NEP)	Offering Academic Unit
Elective/MOOCs/Innovation activity related to the I.MTech. project	3	PEC	ScSE	SEST/UoH/MOOCs/Innovation Club+Mentor
Elective/MOOCs/Innovation activity related to the I.MTech. project	3	PEC	ScSE	SEST/UoH/MOOCs/Innovation Club+Mentor
Manufacturing Lab	4	PCC	Major	SEST
Mini Project (in specialized area of interest keeping in view the I.MTech. project)/Internship	10	Project work	RI	SEST/Industry/Research Institute
<b>Total Credits, Sem-8 = 20</b>		<b>Cumulative Credits at the end of Sem-8 = 162</b>		

<b>Semester-VIII (exit batch)</b>				
Course Title	Credits	Type of Subject (AICTE)	Type of Subject (UoH NEP)	Offering Academic Unit
B.Tech. Major Project (Understanding the problem definition + literature review + experimental/theoretical work)	10	Project work (Clearly defining the sustainability aspects)	RI	SEST

B.Tech. Major Project - Thesis writing + Seminar + Viva Voce Exam	10	Project work (Clearly defining the sustainability aspects)	RI	SEST
<b>Total Credits, Sem-8 = 20</b>		<b>Total Credits at the end of Sem-8 to exit = 162</b> <b>Total Credits at the end of Sem-8 to exit (Honors) = 182</b>		

**5<sup>th</sup> Year**

<b>Semester-IX</b>				
<b>Course Title</b>	<b>Credits</b>	<b>Type of Subject (AICTE)</b>	<b>Type of Subject (UoH NEP)</b>	<b>Offering Academic Unit</b>
I.M.Tech. Project (Understanding the problem definition + literature review + experimental/theoretical work) – Continuous Assessment	10	Project work (Clearly defining the sustainability aspects)	RI	SEST/SEST+Collaboration
Mini Report (Introduction+Literature Review+ Problem Definition+ Objectives) + I.M.Tech. Project seminar	10	Project work (Clearly defining the sustainability aspects)	RI	SEST/SEST+Collaboration
Mid-Term Evaluation (will be recorded by the School and remain with the School till the end of Sem-X)	<b>20</b>			
<b>Total Credits, Sem-9 = 20</b>		<b>Cumulative Credits at the end of Sem-9 = 182</b>		
<b>Semester-X</b>				
<b>Course Title</b>	<b>Credits</b>	<b>Category</b>		<b>Offering Academic Unit</b>
I.M.Tech. Project (continuation of experimental/theoretical work from the previous semester) + Thesis writing)	12	Project work (Clearly defining the sustainability aspects)		SEST/SEST+Collaboration
I.M.Tech. Seminar + Viva Voce Exam	8	Project work (Clearly defining the sustainability aspects)		SEST/SEST+Collaboration
Semester-X Evaluation	<b>20</b>			
I.M.Tech. Project (Sem IX+X) Evaluation	<b>40</b>			
<b>Total Credits, Sem-10 = 20</b>		<b>Total Credits at the end of Sem-10 = 202</b>		