

AM JALAL ABDUL KALAM
TECHNOLOGICAL
UNIVERSITY

CURRICULUM

B.TECH (2019 SCHEME)



METALLURGICAL AND MATERIALS ENGINEERING

**CURRICULUM I TO VIII: B.TECH METALLURGICAL AND MATERIALS
ENGINEERING**

Every course of B. Tech. Program shall be placed in one of the nine categories as listed in table below.

Sl. No	Category	Code	Credits
1	Humanities and Social Sciences including Management courses	HMC	8
2	Basic Science courses	BSC	26
3	Engineering Science Courses	ESC	22
4	Program Core Courses	PCC	76
5	Program Elective Courses	PEC	15
6	Open Elective Courses	OEC	3
7	Project work and Seminar	PWS	10
8	Non-credit (P/F)Courses Mandatory with grade	MNC	-----
9	Mandatory Student Activities (P/F)	MSA	2
Total Mandatory Credits		162	
10	Value Added Course (Optional)	VAC	20

No semesters shall have more than six lecture-based courses and two laboratory and/or drawing/seminar/project courses in the curriculum. Semester- wise credit distribution shall be as below:

Sem	1	2	3	4	5	6	7	8	Total
Credits	17	21	22	22	23	23	15	17	160
Activity Points	50				50				---
Credits for Activity	2								2
G.Total									162

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Basic Science Courses: Maths, Physics, Chemistry, Biology for Engineers, Life Science etc

Engineering science courses: Basic Electrical, Engineering Graphics, Programming, Workshop, Basic Electronics, Basic Civil, Engineering Mechanics, Mechanical Engineering, Thermodynamics, Design Engineering, Materials Engineering etc.

Humanities and Social Sciences including Management courses: English, Humanities, Professional Ethics, Management, Finance & Accounting, Life Skills, Professional Communication, Economics etc

Mandatory non-credit courses: Sustainable Engineering, Constitution of India/Essence of Indian Knowledge Tradition, Industrial Safety Engineering, disaster management etc.

Course Code and Course Number

Each course is denoted by a unique code consisting of three alphabets followed by three numerals like **E C L 2 0 1**. The first two letter code refers to the department offering the course. EC stands for course in Electronics & Communication, course code MA refers to a course in Mathematics, course code ES refers to a course in Engineering Science etc. Third letter stands for the nature of the course as indicated in the Table 1.

Table 1: Code for the courses

Code	Description
T	Theory based courses (other the lecture hours, these courses can have tutorial and practical hours, e.g., L-T-P structures 3-0-0, 3-1-2, 3-0-2 etc.)
L	Laboratory based courses (where performance is evaluated primarily on the basis of practical or laboratory work with LTP structures like 0-0-3, 1-0-3, 0-1-3 etc.)
N	Non-credit courses
D	Project based courses (Major, Mini Projects)
Q	Seminar Courses

Course Number is a three digit number and the first digit refers to the Academic year in which the course is normally offered, i.e. 1, 2, 3, or 4 for the B. Tech. Programme of four year duration. Of the other two digits, the last digit identifies whether the course is offered normally in the odd (odd number), even (even number) or in both the semesters (zero). The middle number could be any digit. ECL 201 is a laboratory course offered in EC department for third semester, MAT 101 is a course in Mathematics offered in the first semester, EET 344 is a course in Electrical Engineering offered in the sixth semester, PHT 110 is a course in Physics offered both the first and second semesters, EST 102 is a course in Basic Engineering offered by one or many departments. These course numbers are to be given in the curriculum and syllabi.

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Departments

Each course is offered by a Department and their two-letter course prefix is given in Table 2.

Table 2: Departments and their codes

Sl.No	Department	Course Prefix	Sl.No	Department	Course Prefix
01	Aeronautical Engg	AO	16	Information Technology	IT
02	Applied Electronics & Instrumentation	AE	17	Instrumentation & Control	IC
03	Automobile	AU	18	Mandatory Courses	MC
04	Biomedical Engg	BM	19	Mathematics	MA
05	Biotechnology	BT	20	Mechanical Engg	ME
06	Chemical Engg	CH	21	Mechatronics	MR
07	Chemistry	CY	22	Metallurgical & Materials Engineering	MT
08	Civil Engg	CE	23	Mechanical (Auto)	MU
09	Computer Science	CS	24	Mechanical(Prod)	MP
10	Electrical & Electronics	EE	25	Naval & Ship Building	SB
11	Electronics & Biomedical	EB	26	Physics	PH
12	Electronics & Communication	EC	27	Polymer Engg	PO
13	Food Technology	FT	28	Production Engg	PE
14	Humanities	HU	29	Robotics and Automation	RA
15	Industrial Engg	IE	30	Safety & Fire Engg	FS

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SEMESTER I

SLOT	COURSE NO.	COURSES	L-T-P	HOURS	CREDIT
A	MAT101	LINEAR ALGEBRA AND CALCULUS	3-1-0	4	4
B 1/2	PHT110	ENGINEERING PHYSICS B	3-1-0	4	4
	CYT100	ENGINEERING CHEMISTRY	3-1-0	4	4
C 1/2	EST100	ENGINEERING MECHANICS	2-1-0	3	3
	EST110	ENGINEERING GRAPHICS	2-0-2	4	3
D 1/2	EST120	BASICS OF CIVIL & MECHANICAL ENGINEERING	4-0-0	4	4
	EST130	BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING	4-0-0	4	4
E	HUT101	LIFE SKILLS	2-0-2	4	--
S 1/2	PHL120	ENGINEERING PHYSICS LAB	0-0-2	2	1
	CYL120	ENGINEERING CHEMISTRY LAB	0-0-2	2	1
T 1/2	ESL120	CIVIL & MECHANICAL WORKSHOP	0-0-2	2	1
	ESL130	ELECTRICAL & ELECTRONICS WORKSHOP	0-0-2	2	1
TOTAL				23/24 *	17

*Minimum hours per week

NOTE:

To make up for the hours lost due to induction program, one extra hour may be allotted to each course

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SEMESTER II

SLOT	COURSE NO.	COURSES	L-T-P	HOURS	CREDIT
A	MAT 102	VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS	3-1-0	4	4
B 1/2	PHT 110	ENGINEERING PHYSICS B	3-1-0	4	4
	CYT 100	ENGINEERING CHEMISTRY	3-1-0	4	4
C 1/2	EST 100	ENGINEERING MECHANICS	2-1-0	3	3
	EST 110	ENGINEERING GRAPHICS	2-0-2	4	3
D 1/2	EST 120	BASICS OF CIVIL & MECHANICAL ENGINEERING	4-0-0	4	4
	EST 130	BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING	4-0-0	4	4
E	HUT 102	PROFESSIONAL COMMUNICATION	2-0-2	4	--
F	EST 102	PROGRAMMING IN C	2-1-2	5	4
S 1/2	PHL 120	ENGINEERING PHYSICS LAB	0-0-2	2	1
	CYL 120	ENGINEERING CHEMISTRY LAB	0-0-2	2	1
T 1/2	ESL 120	CIVIL & MECHANICAL WORKSHOP	0-0-2	2	1
	ESL 130	ELECTRICAL & ELECTRONICS WORKSHOP	0-0-2	2	1
TOTAL				28/29	21

NOTE:

1. Engineering Physics B and Engineering Chemistry shall be offered in both semesters. Institutions can advise students belonging to about 50% of the number of branches in the Institution to opt for Engineering Physics B in S1 and Engineering Chemistry in S2 & vice versa. Students opting for Engineering Physics B in a semester should attend Physics Lab in the same semester and students opting for Engineering Chemistry in one semester should attend Engineering Chemistry Lab in the same semester.
2. Engineering Mechanics and Engineering Graphics shall be offered in both semesters. Institutions can advise students belonging to about 50% of the number of branches

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in the Institution to opt for Engineering Mechanics in S1 and Engineering Graphics in S2 & vice versa.

3. Basics of Civil & Mechanical Engineering and Basics of Electrical & Electronics Engineering shall be offered in both semesters. Basics of Civil & Mechanical Engineering contain equal weightage for Civil Engineering and Mechanical Engineering. Slot for the course is D with CIE marks of 25 each and ESE marks of 50 each. Students belonging to branches of AEI, EI, BME, ECE, EEE, ICE, CSE, IT, RA can choose this course in S1.

Basics of Electrical & Electronics Engineering contain equal weightage for Electrical Engineering and Electronics Engineering. Slot for the course is D with CIE marks of 25 each and ESE marks of 50 each. Students belonging to AERO, AUTO, CE, FSE, IE, ME, MECHATRONICS, PE, METALLURGICAL & MATERIALS ENGINEERING, BT, BCE, CHEM, FT, POLY can choose this course in S1. Students having Basics of Civil & Mechanical Engineering in one semester should attend Civil & Mechanical Workshop in the same semester and students having Basics of Electrical & Electronics Engineering in a semester should attend Electrical & Electronics Workshop in the same semester.

4. LIFE SKILLS

Life skills are those competencies that provide the means for an individual to be resourceful and positive while taking on life's vicissitudes. Development of one's personality by being aware of the self, connecting with others, reflecting on the abstract and the concrete, leading and generating change, and staying rooted in time-tested values and principles is being aimed at. This course is designed to enhance the employability and maximize the potential of the students by introducing them to the principles that underlie personal and professional success, and help them acquire the skills needed to apply these principles in their lives and careers.

5. PROFESSIONAL COMMUNICATION

Objective is to develop in the under-graduate students of engineering a level of competence in English required for independent and effective communication for their professional needs. Coverage: Listening, Barriers to listening, Steps to overcome them, Purposive listening practice, Use of technology in the professional world. Speaking, Fluency & accuracy in speech, Positive thinking, Improving self-expression, Tonal variations, Group discussion practice, Reading, Speed reading practice, Use of extensive readers, Analytical and critical reading practice, Writing Professional Correspondence, Formal and informal letters, Tone in formal writing, Introduction to reports. Study Skills, Use of dictionary, thesaurus etc., Importance of contents page, cover & back pages, Bibliography, Language Lab.

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SEMESTER III

SLOT	COURSE NO.	COURSES	L-T-P	HOURS	CREDIT
A	MAT201	PARTIAL DIFFERENTIAL EQUATION AND COMPLEX ANALYSIS	3-1-0	4	4
B	MTT201	METALLURGICAL THERMODYNAMICS AND KINETICS	3-1-0	4	4
C	MTT203	PHYSICAL METALLURGY	3-1-0	4	4
D	MTT205	MINERAL BENEFICIATION	3-1-0	4	4
E 1/2	EST200	DESIGN & ENGINEERING	2-0-0	2	2
	HUT200	PROFESSIONAL ETHICS	2-0-0	2	2
F	MCN201	SUSTAINABLE ENGINEERING	2-0-0	2	--
S	MTL201	MINERAL DRESSING LAB	0-0-3	3	2
T	MTL203	METALLOGRAPHY LAB	0-0-3	3	2
R/M	VAC	REMEDIAL/MINOR COURSE	3-1-0	4 *	4
TOTAL				26/30	22/26

NOTE:

1. Design & Engineering and Professional Ethics shall be offered in both S3 and S4. Institutions can advise students belonging to about 50% of the number of branches in the Institution to opt for Design & Engineering in S3 and Professional Ethics in S4 & vice versa.
2. *All Institutions shall keep 4 hours exclusively for Remedial class/Minor course (Thursdays from 3 to 5 PM and Fridays from 2 to 4 PM). If a student does not opt for minor programme, he/she can be given remedial class.

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SEMESTER IV

SLOT	COURSE NO.	COURSES	L-T-P	HOURS	CREDIT
A	MAT202	PROBABILITY, STATISTICS AND NUMERICAL METHODS	3-1-0	4	4
B	MTT202	HEAT TREATMENT OF MATERIALS	3-1-0	4	4
C	MTT204	TRANSPORT PHENOMENA	3-1-0	4	4
D	MTT206	MECHANICAL BEHAVIOR OF MATERIALS	3-1-0	4	4
E 1/2	EST200	DESIGN & ENGINEERING	2-0-0	2	2
	HUT200	PROFESSIONAL ETHICS	2-0-0	2	2
F	MCN202	CONSTITUTION OF INDIA	2-0-0	2	--
S	MTL202	HEAT TREATMENT LAB	0-0-3	3	2
T	MTL204	MATERIALS TESTING LAB	0-0-3	3	2
R/M/H	VAC	REMEDIAL/MINOR/HONOURS COURSE	3-1-0	4*	4
TOTAL				26/30	22/26

NOTE:

- Design & Engineering and Professional Ethics shall be offered in both S3 and S4. Institutions can advise students belonging to about 50% of the number of branches in the Institution to opt for Design & Engineering in S3 and Professional Ethics in S4 & vice versa.
- *All Institutions should keep 4 hours exclusively for Remedial class/Minor course (Thursdays from 3 to 5 PM and Fridays from 2 to 4 PM). If a student does not opt for minor programme, he/she can be given remedial class.

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SEMESTER V

SLOT	COURSE NO.	COURSES	L-T-P	HOURS	CREDIT
A	MTT301	IRON AND STEEL MAKING	3-1-0	4	4
B	MTT303	NON FERROUS EXTRACTION OF METALS	3-1-0	4	4
C	MTT305	FOUNDRY TECHNOLOGY	3-1-0	4	4
D	MTT307	MATERIALS JOINING TECHNOLOGY	3-1-0	4	4
E 1/2	HUT300	INDUSTRIAL ECONOMICS & FOREIGN TRADE	3-0-0	3	3
	HUT310	MANAGEMENT FOR ENGINEERS	3-0-0	3	3
F	MCN301	DISASTER MANAGEMENT	2-0-0	2	--
S	MTL331	FOUNDRY LAB	0-0-3	3	2
T	MTL333	MATERIALS JOINING LAB	0-0-3	3	2
R/M/H	VAC	REMEDIAL/MINOR/HONOURS COURSE	3-1-0	4*	4
TOTAL				27/31	23/27

NOTE:

1. Industrial Economics & Foreign Trade and Management for Engineers shall be offered in both S5 and S6. Institutions can advise students belonging to about 50% of the number of branches in the Institution to opt for Industrial Economics & Foreign Trade in S5 and Management for Engineers in S6 and vice versa.
2. *All Institutions should keep 4 hours exclusively for Remedial class/Minor/Honours course (Tuesdays from 3 to 5 PM and Wednesdays from 3 to 5 PM). If a student does not opt for minor/honours programme, he/she can be given remedial class.

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SEMESTER VI

SLOT	COURSE NO.	COURSES	L-T-P	HOURS	CREDIT
A	MTT302	CORROSION ENGINEERING	3-1-0	4	4
B	MTT304	DEFORMATION PROCESSING	3-1-0	4	4
C	MTT306	MATERIALS CHARACTERIZATION	3-1-0	4	4
D	MTTXXX	PROGRAM ELECTIVE I	2-1-0	3	3
E 1/2	HUT300	INDUSTRIAL ECONOMICS & FOREIGN TRADE	3-0-0	3	3
	HUT310	MANAGEMENT FOR ENGINEERS	3-0-0	3	3
F	MTT308	COMPREHENSIVE COURSE WORK	1-0-0	1	1
S	MTL332	CORROSION ENGINEERING LAB	0-0-3	3	2
T	MTL334	SOFTWARE LAB	0-0-3	3	2
R/M/ H	VAC	REMEDIAL/MINOR/HONOURS COURSE	3-1-0	4*	4
TOTAL				25/29	23/27

PROGRAM ELECTIVE I

SLOT	COURSE NO.	COURSES	L-T-P	HOURS	CREDIT
D	MTT312	DESIGN AND SELECTION OF MATERIALS	2-1-0	3	3
	MTT322	AUTOMOTIVE MATERIALS	2-1-0		
	MTT332	MECHANICAL TECHNOLOGY	2-1-0		
	MTT342	ELECTRICAL, ELECTRONIC, OPTICAL AND MAGNETIC MATERIALS	2-1-0		
	MTT352	MEASUREMENTS AND CONTROL	2-1-0		
	MTT362	NANO-MATERIALS AND APPLICATIONS	2-1-0		
	MTT372	ENERGY MATERIALS AND TECHNOLOGY	2-1-0		

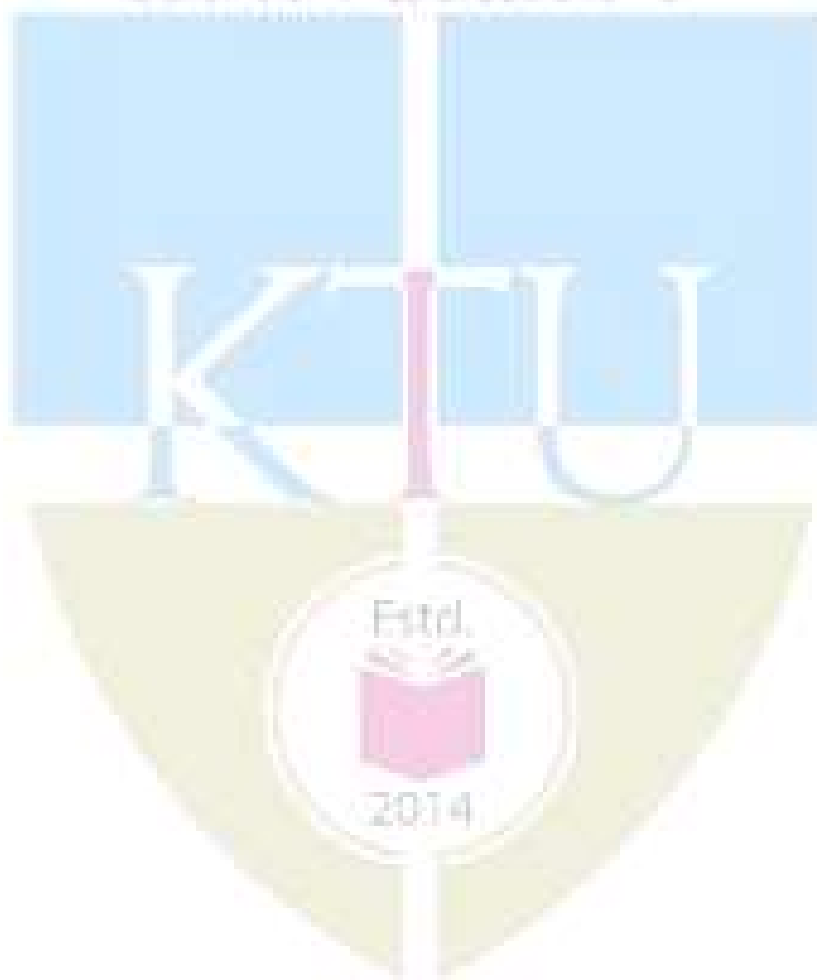
NOTE:

1. Industrial Economics & Foreign Trade and Management for Engineers shall be offered in both S5 and S6. Institutions can advise students belonging to about 50% of the number of

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branches in the Institution to opt for Industrial Economics & Foreign Trade in S5 and Management for Engineers in S6 and vice versa.

2. *All Institutions should keep 4 hours exclusively for Remedial class/Minor/Honours course (Tuesdays from 3 to 5 PM and Wednesdays from 2 to 4 PM). If a student does not opt for minor/honours programme, he/she can be given remedial class.
3. **Comprehensive Course Work:** The comprehensive course work in the sixth semester of study shall have a written test of 50 marks. The written examination will be of objective type similar to the GATE examination and will be conducted by the University. **Syllabus for comprehensive examination shall be prepared by the respective BOS choosing any 5 core courses studied from semester 3 to 5.** The pass minimum for this course is 25. The course should be mapped with a faculty and classes shall be arranged for practising questions based on the core courses listed in the curriculum.



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SEMESTER VII

SLOT	COURSE NO.	COURSES	L-T-P	HOURS	CREDIT
A	MTT401	NON-DESTRUCTING TESTING	2-1-0	3	3
B	MTTXXX	PROGRAM ELECTIVE II	2-1-0	3	3
C	MTTXXX	OPEN ELECTIVE	2-1-0	3	3
D	MCN401	INDUSTRIAL SAFETY ENGINEERING	2-1-0	3	---
S	MTL411	NON DESTRUCTIVE TESTING LAB	0-0-3	3	2
T	MTQ413	SEMINAR	0-0-3	3	2
U	MTD415	PROJECT PHASE I	0-0-6	6	2
R/M/H	VAC	REMEDIAL/MINOR/HONOURS COURSE	3-1-0	4*	4
TOTAL				24/28	15/19

PROGRAM ELECTIVE II

SLOT	COURSE NO.	COURSES	L-T-P	HOURS	CREDIT
B	MTT413	POWDER METALLURGY	2-1-0	3	3
	MTT423	NUCLEAR METALLURGY	2-1-0		
	MTT433	ELECTRICAL ENGINEERING MATERIALS	2-1-0		
	MTT443	SEMICONDUCTOR MATERIALS AND DEVICES	2-1-0		
	MTT453	EMERGING MATERIALS	2-1-0		
	MTT463	METALLURGY OF TOOL MATERIALS	2-1-0		
	MTT473	MATERIALS FOR EXTREME ENVIRONMENTS	2-1-0		

OPEN ELECTIVE

The open elective is offered in semester 7. Each program should specify the courses (maximum 5) they would like to offer as electives for other programs. The courses listed below are offered by the **Department of METALLURGICAL AND MATERIALS ENGINEERING** for students of other undergraduate branches offered in the college under KTU.

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SLOT	COURSE NO.	COURSES	L-T-P	HOURS	CREDIT
C	MTT 415	INTRODUCTION TO QUALITY MANAGEMENT	2-1-0	3	3
	MTT 425	NON DESTRUCTIVE TESTING AND FAILURE ANALYSIS	2-1-0		
	MTT 435	PHYSICS OF MATERIALS	2-1-0		
	MTT 445	FUNDAMENTALS OF NANO MATERIALS	2-1-0		

NOTE:

- *All Institutions should keep 4 hours exclusively for Remedial class/Minor/Honours course (Mondays from 10 to 12 and Wednesdays from 10 to 12 Noon). If a student does not opt for minor/honours programme, he/she can be given remedial class.
- Seminar: To encourage and motivate the students to read and collect recent and reliable information from their area of interest confined to the relevant discipline from technical publications including peer reviewed journals, conference, books, project reports etc., prepare a report based on a central theme and present it before a peer audience. Each student shall present the seminar for about 20 minutes duration on the selected topic. The report and the presentation shall be evaluated by a team of faculty members comprising Academic coordinator for that program, seminar coordinator and seminar guide based on style of presentation, technical content, adequacy of references, depth of knowledge and overall quality of the report.
 Total marks: 100, only CIE, minimum required to pass 50
 Attendance : 10
 Guide : 20
 Technical Content of the Report : 30
 Presentation : 40
- Project Phase I: A Project topic must be selected either from research literature or the students themselves may propose suitable topics in consultation with their guides. The object of Project Work I is to enable the student to take up investigative study in the broad field of Metallurgical and Materials Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on a group of three/four students, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:
 - Survey and study of published literature on the assigned topic;

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- Preparing an Action Plan for conducting the investigation, including team work;
- Working out a preliminary Approach to the Problem relating to the assigned topic;
- Block level design documentation
- Conducting preliminary Analysis/ Modelling/ Simulation/ Experiment/ Design/ Feasibility;
- Preparing a Written Report on the Study conducted for presentation to the Department;
- Final Seminar, as oral Presentation before the evaluation committee.

Total marks: 100, only CIE, minimum required to pass 50

Guide	: 30
Interim evaluation by the evaluation committee	: 20
Final Seminar	: 30
The report evaluated by the evaluation committee	: 20

The evaluation committee comprises HoD or a senior faculty member, Project coordinator and project supervisor.



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SEMESTER VIII

SLOT	COURSE NO.	COURSES	L-T-P	HOURS	CREDIT
A	MTT402	CERAMICS, POLYMERS AND COMPOSITE MATERIALS	2-1-0	3	3
B	MTTXXX	PROGRAM ELECTIVE III	2-1-0	3	3
C	MTTXXX	PROGRAM ELECTIVE IV	2-1-0	3	3
D	MTTXXX	PROGRAM ELECTIVE V	2-1-0	3	3
T	MTT404	COMPREHENSIVE COURSE VIVA	1-0-0	1	1
U	MTD416	PROJECT PHASE II	0-0-12	12	4
R/M/H	VAC	REMEDIAL/MINOR/HONOURS COURSE	3-1-0	4*	4
TOTAL				25/29	17/21

PROGRAM ELECTIVE III

SLOT	COURSE NO.	COURSES	L-T-P	HOURS	CREDIT
B	MTT414	METALLURGICAL FAILURE ANALYSIS	2-1-0	3	3
	MTT424	FATIGUE, CREEP AND FRACTURE	2-1-0		
	MTT434	SPECIAL CASTING TECHNIQUES	2-1-0		
	MTT444	LADLE METALLURGY AND CONTINUOUS CASTING OF STEELS	2-1-0		
	MTT454	ALLOY DEVELOPMENT	2-1-0		
	MTT464	HIGH TEMPERATURE MATERIALS	2-1-0		
	MTT474	SURFACE ENGINEERING	2-1-0		

PROGRAM ELECTIVE IV

SLOT	COURSE NO.	COURSES	L-T-P	HOURS	CREDIT
C	MTT416	NON FERROUS PHYSICAL METALLURGY	2-1-0	3	3
	MTT426	PARTICULATE PROCESSING	2-1-0		
	MTT436	SMART MATERIALS	2-1-0		
	MTT446	BIO-MATERIALS	2-1-0		
	MTT456	MANUFACTURING METHODS	2-1-0		
	MTT466	FRACTURE MECHANICS	2-1-0		
	MTT476	FUELS, FURNACES AND REFRACTORIES	2-1-0		

PROGRAM ELECTIVE V

SLOT	COURSE NO.	COURSES	L-T-P	HOURS	CREDIT
D	MTT418	NON TRADITIONAL MACHINING	2-1-0	3	3
	MTT428	NON METALLIC MATERIALS	2-1-0		
	MTT438	COMPUTATIONAL MATERIALS SCIENCE	2-1-0		
	MTT448	ADVANCES IN METAL FORMING	2-1-0		
	MTT458	CERAMICS AND GLASSES	2-1-0		
	MTT468	RUBBER AND TYRE TECHNOLOGY	2-1-0		
	MTT478	PROCESS MODELLING AND APPLICATIONS	2-1-0		

NOTE:

- *All Institutions should keep 4 hours exclusively for Remedial class/Minor/Honours course (Mondays from 10 to 12 and Wednesdays from 10 to 12). If a student does not opt for minor/honours programme, he/she can be given remedial class.
- Comprehensive Course Viva:** The comprehensive course viva in the eighth semester of study shall have a viva voce for 50 marks. The viva voce shall be conducted based on the core subjects studied from third to eighth semester. The viva voce will be conducted by the same three member committee assigned for final project phase II evaluation towards the end of the semester. The pass minimum for this course is 25. The course should be mapped with a faculty and classes shall be arranged for practising questions based on the core courses listed in the curriculum. The mark will be treated as internal and should be uploaded along with internal marks of other courses.
- Project Phase II:** The object of Project Work II & Dissertation is to enable the student to extend further the investigative study taken up in Project 1, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:
 - In depth study of the topic assigned in the light of the Report prepared under Phasel;
 - Review and finalization of the Approach to the Problem relating to the assigned topic;
 - Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed;
 - Final development of product/process, testing, results, conclusions and future directions;

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- Preparing a paper for Conference presentation/Publication in Journals, if possible;
- Preparing a Dissertation in the standard format for being evaluated by the Department;
- Final Presentation before a Committee

Total marks: 150, only CIE, minimum required to pass 75

Guide : 30

Interim evaluation, 2 times in the semester by the evaluation committee : 50

Quality of the report evaluated by the above committee : 30

(The evaluation committee comprises HoD or a senior faculty member, Project coordinator and project supervisor).

Final evaluation by a three member committee : 40

(The final evaluation committee comprises Project coordinator, expert from Industry/research Institute and a senior faculty from a sister department. The same committee will conduct comprehensive course viva for 50 marks).

MINOR

Minor is an additional credential a student may earn if s/he does 20 credits worth of additional learning in a discipline other than her/his major discipline of B.Tech. degree. The objective is to permit a student to customize their Engineering degree to suit their specific interests. Upon completion of an Engineering Minor, a student will be better equipped to perform interdisciplinary research and will be better employable. Engineering Minors allow a student to gain interdisciplinary experience and exposure to concepts and perspectives that may not be a part of their major degree programs.

The academic units offering minors in their discipline will prescribe the set of courses and/or other activities like projects necessary for earning a minor in that discipline. A specialist basket of 3-6 courses is identified for each Minor. Each basket may rest on one or more foundation courses. A basket may have sequences within it, i.e., advanced courses may rest on basic courses in the basket. S/he accumulates credits by registering for the required courses, and if the requirements for a particular minor are met within the time limit for the course, the minor will be awarded. This will be mentioned in the Degree Certificate as "Bachelor of Technology in xxx with Minor in yyy". The fact will also be reflected in the consolidated grade card, along with the list of courses taken. If one specified course cannot be earned during the course of the programme, that minor will not be awarded. The individual course credits earned, however, will be reflected in the consolidated grade card.

(i) The curriculum/syllabus committee/BOS shall prepare syllabus for courses to be included in the curriculum from third to eight semesters for all branches. The minor courses shall be identified by **M slot courses**.

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(ii) Registration is permitted for Minor at the beginning of third semester. Total credits required is 182 (162 + 20 credits from value added courses)

(iii) Out of the 20 Credits, 12 credits shall be earned by undergoing a minimum of three courses listed in the curriculum for minor, of which one course shall be a miniproject based on the chosen area. They can do miniproject either in S7 or in S8. The remaining 8 credits could be acquired by undergoing 2 MOOCs recommended by the Board of studies and approved by the Academic Council or through courses listed in the curriculum. The classes for Minor shall be conducted along with regular classes and no extra time shall be required for conducting the courses.

(iv) There won't be any supplementary examination for the courses chosen for Minor.

(v) On completion of the program, "Bachelor of Technology in xxx with Minor in yyy" will be awarded.

(vi) The registration for minor program will commence from semester 3 and the all academic units offering minors in their discipline should prescribe set of such courses. The courses shall be grouped into maximum of 3 baskets. The basket of courses may have sequences within it, i.e., advanced courses may rest on basic courses in the basket. Reshuffling of courses between various baskets will not be allowed. In any case, they should carry out a mini project based on the chosen area in S7 or S8. Students who have registered for **B.Tech Minor in METALLURGICAL AND MATERIALS ENGINEERING** can opt to study the courses listed below:

S e m e s t e r	MATERIALS SCIENCE				METALLURGICAL ENGINEERING				INDUSTRIAL METALLURGY			
	Course No.	Course Name	H O U R S	C R E D I T	Course No.	Course Name	H O U R S	C R E D I T	Course No.	Course Name	H O U R S	C R E D I T
S3	MTT281	PRINCIPLES OF PHYSICAL METALLURGY	4	4	MTT283	BASICS OF METALLURGICAL ENGINEERING	4	4	MTT285	MATERIAL SELECTION FOR INDUSTRIAL APPLICATIONS	4	4
S4	MTT282	METALLURGICAL HEAT TREATMENT	4	4	MTT284	ENGINEERING MATERIALS	4	4	MTT286	MECHANICAL METALLURGY	4	4
S5	MTT381	COMPOSITE MATERIALS	4	4	MTT383	INTRODUCTION TO FOUNDRY TECHNOLOGY	4	4	MTT385	WELDING METALLURGY	4	4
S6	MTT382	TESTING AND EVALUATION OF MATERIALS	4	4	MTT384	NON DESTRUCTIVE EVALUATION	4	4	MTT386	INTRODUCTION TO MATERIALS CHARACTERIZATION	4	4

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S7	MTD481	MINIPROJECT	4	4	MTD481	MINIPROJECT	4	4	MTD481	MINIPROJECT	4	4
S8	MTD482	MINIPROJECT	4	4	MTD482	MINIPROJECT	4	4	MTD482	MINIPROJECT	4	4

HONOURS

Honours is an additional credential a student may earn if s/he opts for the extra 20 credits needed for this in her/his own discipline. Honours is not indicative of class. KTU is providing this option for academically extra brilliant students to acquire Honours. Honours is intended for a student to gain expertise/specialise in an area inside his/her major B.Tech discipline and to enrich knowledge in emerging/advanced areas in the branch of engineering concerned. It is particularly suited for students aiming to pursue higher studies. Upon completion of Honours, a student will be better equipped to perform research in her/his branch of engineering. On successful accumulation of credits at the end of the programme, this will be mentioned in the Degree Certificate as “Bachelor of Technology in Metallurgical and Materials Engineering with Honours.” The fact will also be reflected in the consolidated grade card, along with the list of courses taken. If one specified course cannot be earned during the course of the programme, Honours will not be awarded. The individual course credits earned, however, will be reflected in the consolidated grade card.

The courses shall be grouped into maximum of 3 groups, each group representing a particular specialization in the branch. The students shall select only the courses from same group in all semesters. It means that the specialization is to be fixed by the student and cannot be changed subsequently. The internal evaluation, examination and grading shall be exactly as for other mandatory courses. The Honours courses shall be identified by H slot courses.

- (i) The curriculum/syllabus committee/BoS shall prepare syllabus for courses to be included in the curriculum from fourth to eight semesters for all branches. The honours courses shall be identified by H slot courses.
- (ii) Registration is permitted for Honours at the beginning of fourth semester. Total credits required is 182 (162 + 20 credits from value added courses).
- (iii) Out of the 20 Credits, 12 credits shall be earned by undergoing a minimum of three courses listed in the curriculum for honours, of which one course shall be a mini project based on the chosen area. The remaining 8 credits could be acquired by undergoing 2 MOOCs recommended by the Board of studies and approved by the Academic Council or through courses listed in the curriculum. The classes for Honours shall be conducted along with regular classes and no extra time shall be required for conducting the courses. The students should earn a grade of ‘C’ or better for all courses under honours.

METALLURGICAL AND MATERIALS ENGINEERING

- (iv) There won't be any supplementary examination for the courses chosen for honours.
- (v) On successful accumulation of credits at the end of the programme, "Bachelor of Technology in xxx, with Honours" will be awarded if overall CGPA is greater than or equal to 8.5, earned a grade of 'C' or better for all courses chosen for honours and without any history of 'F' Grade.
- (vi) The registration for honours program will commence from semester 4 and the all academic units offering honours in their discipline should prescribe set of such courses. The courses shall be grouped into maximum of 3 groups, each group representing a particular specialization in the branch. The students shall select only the courses from same group in all semesters. It means that the specialization is to be fixed by the student and cannot be changed subsequently. In any case, they should carry out a mini project based on the chosen area in S8. Students who have registered for **B.Tech Honours in METALLURGICAL AND MATERIALS ENGINEERING** can opt to study the courses listed below:

S E M E S T E R	Group-I				Group-II				Group-III			
	Course No.	Course Name	H O U R S	C R E D I T	Course No.	Course Name	H O U R S	C R E D I T	Course No.	Course Name	H O U R S	C R E D I T
S 4	MTT292	ADVANCED THERMODYNAMICS OF MATERIALS	4	4	MTT294	ALLOY DESIGN AND DEVELOPMENT	4	4	MTT296	RECENT DEVELOPMENTS IN WELDING PROCESSES	4	4
S 5	MTT393	PHASE TRANSFORMATIONS	4	4	MTT395	ECONOMICS OF METAL PRODUCTION PROCESSES	4	4	MTT397	RECENT TRENDS IN NANO MATERIALS	4	4
S 6	MTT394	CRYSTALLOGRAPHY	4	4	MTT396	RECENT TRENDS IN METAL FORMING PROCESSES	4	4	MTT398	ADVANCED CHARACTERIZATION TECHNIQUES	4	4
S 7	MTT495	EXPERIMENTAL TECHNIQUES IN MATERIALS SCIENCE	4	4	MTT497	AEROSPACE MATERIALS	4	4	MTT499	ADVANCED SOLIDIFICATION PROCESSING	4	4
S 8	MTD496	MINIPROJECT	4	4	MTD496	MINIPROJECT	4		MTD496	MINIPROJECT	4	4

INDUCTION PROGRAM

There will be three weeks induction program for first semester students. It is a unique three-week immersion Foundation Programme designed especially for the fresher's which includes a wide range of activities right from workshops, lectures and seminars to sports tournaments, social work and much more. The programme is designed to mould students into well-rounded individuals, aware and sensitized to local and global conditions and foster their creativity, inculcate values and ethics, and help students to discover their passion. Foundation Programme also serves as a platform for the fresher's to interact with their batchmates and seniors and start working as a team with them. The program is structured around the following five themes:

The programme is designed keeping in mind the following objectives:

- **Values and Ethics:** Focus on fostering a strong sense of ethical judgment and moral fortitude.
- **Creativity:** Provide channels to exhibit and develop individual creativity by expressing themselves through art, craft, music, singing, media, dramatics, and other creative activities.
- **Leadership, Communication and Teamwork:** Develop a culture of teamwork and group communication.
- **Social Awareness:** Nurture a deeper understanding of the local and global world and our place in it as concerned citizens of the world.
- **Physical Activities & Sports:** Engage students in sports and physical activity to ensure healthy physical and mental growth.

