

**RAJIV GANDHI UNIVERSITY OF KNOWLEDGE TECHNOLOGIES
ANDHRA PRADESH**

(NUZVID-RKVALLEY-SRIKAKULAM-ONGOLE CAMPUSES)

**DEPARTMENT OF METALLURGICAL AND
MATERIALS ENGINEERING**



**DRAFT COURSE STRUCTURE AND DETAILED SYLLABUS FOR THE
B.TECH PROGRAM**

IN

METALLURGICAL AND MATERIALS ENGINEERING

(BOARD OF STUDIES PROPOSED COPY)



General, Course structure, Semester-wise credit distribution

A. Definition of Credit:

1 Hour Lecture (L) per week	1 credit
1 Hour Tutorial (T) per week	1 credit
3 Hours Practical (Lab)/week	1.5 credits

B. Total number of credits:160

C. Minimum number of contact hours/weeks per semester: 15 weeks of teaching

- a. For 1 credit course: 15 contact hours per semester
- b. For 2 credit course: 30 contact hours per semester
- c. For 3 credit course: 45 contact hours per semester
- d. For 4 credit course: 60 contact hours per semester

D. Course code and definition, Abbreviations

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
BSC	Basic Science Course
PCC	Program Core Course
PEC	Program Elective Course
OEC	Open Elective Course
MC	Mandatory Courses
HSMC	Humanities and Social Sciences including Management Science Course
PROJ	Minor/Major Project
SI	Summer Internship

E. Structure of the Program

S.No	Course Type	Credits
1	Basic Science Courses	20
2	Engineering Science Courses	16
3	Humanities and Social Sciences including Management courses	10
4	Professional core courses	77
5	Professional Elective courses	12
6	Summer Internship + Project Work	11
7	Open Elective Courses	12
8	Mandatory Courses [Environmental Sciences, Indian Constitution, Gender sensitization, Indian Community Services]	2
		Total 160

F. Semester-wise Credits Distribution



	TOTAL	E1-S1	E1-S2	E2-S1	E2-S2	E3-S1	E3-S2	E4-S1	E4-S2
BSC	20	8.5	8.5	3	0	0	0	0	0
ESC	16	11.5	4.5	0	0	0	0	0	0
HSMC	8.5	2.5	0	0	0	1.5	1.5	3	0
PCC	77	0	9.5	19.5	18	20	10	0	0
PEC	12	0	0	0	0	0	3	6	3
OEC	12	0	0	0	3	0	0	3	6
MC	2	0	0	0	0	0	0	0	2
PROJECTS	10.5	0	0	0	0	0	2.5	4	4
SUMMER INTERNSHIP	2	0	0	0	0	0	2	0	0
	160	22.5	22.5	22.5	21	21.5	19	16	15

Total number of Mandatory Courses (MC): 03 (Indian Constitution, Environmental Science, Gender Sensitisation)

***Mandatory Induction Program completes before the start of First year Semester-I.**

Notations:

- E1-S1: Engineering first year first semester
- E1-S2: Engineering first year second semester
- E2-S1: Engineering second year first semester
- E2-S2: Engineering second year second semester
- E3-S1: Engineering third year first semester
- E3-S2: Engineering third year second semester
- E4-S1: Engineering fourth year first semester
- E4-S2: Engineering fourth year second semester

G. Structure of curriculum

Mandatory Induction Program - 3 weeks (before start of First Year Semester-I)

- Physical activity
- Creative Arts
- Universal Human Values
- Literary
- Proficiency Modules
- Lectures by Eminent people
- Visit to local areas
- Familiarization of Dept/Branch Innovations



I Year I Semester

S. N o	Course Code	Course Category	Course Title	L	T	P	Credits
1	20MA1101	BSC	Differential Equations and Multivariable Calculus	3	1	0	4
2	20PY1103	BSC	Engineering Physics	2	1	0	3
3	20CE1114	ESC	Engineering Graphics and Computer Drafting	1	0	3	2.5
4	20ME1113	ESC	Engineering Mechanics	3	0	0	3
5	20CS1108	ESC	Programming and Data Structures	3	0	0	3
6	20EG1181	HSC	English Language Communication Skills Lab-I	1	0	3	2.5
7	20PY1183	BSC	Engineering Physics Laboratory	0	0	3	1.5
8	20CS1188	ESC	Programming and Data Structures Laboratory	0	0	3	1.5
9	20ME1186	ESC	Workshop Manufacturing Practices	0	0	3	1.5
Total				14	1	15	22.5

I Year II Semester

S. N o	Course Code	Course Category	Course Title	L	T	P	Credits
1	20MA1201	BSC	Mathematical Methods	3	1	0	4
2	20CY1204	BSC	Engineering Chemistry	3	0	0	3
3	20EE1209	ESC	Basic Electrical and Electronics Engineering	3	0	0	3
4	20MM1201	PCC	Materials Thermodynamics	3	1	0	4
5	20MM1202	PCC	Physical Metallurgy	3	1	0	4
6	20CY1284	BSC	Engineering Chemistry Laboratory	0	0	3	1.5
7	20EE1289	ESC	Basic Electrical & Electronics Engineering Laboratory	0	0	3	1.5
8	20MM1281	PCC	Physical Metallurgy and Metallography Laboratory	0	0	3	1.5
9	20HS1201	MC	Indian Constitution	2	0	0	0
Total				17	3	9	22.5



II Year I Semester

S. N o	Course Code	Course Category	Course Title	L	T	P	Credit s
1	20MA2104	BSC	Transform Calculus	3	0	0	3
2	20MM2101	PCC	Mineral Processing and Extractive Metallurgy	3	1	0	4
3	20MM2102	PCC	Phase Transformations and Heat Treatment	3	1	0	4
4	20MM2103	PCC	Mechanical Behaviour and Testing of Materials	3	1	0	4
5	20MM2104	PCC	Engineering Polymers	3	0	0	3
6	20MM2181	PCC	Mineral Processing and Extractive Metallurgy Laboratory	0	0	3	1.5
7	20MM2182	PCC	Phase Transformations and Heat Treatment Laboratory	0	0	3	1.5
8	20MM2183	PCC	Mechanical Behaviour and Testing of Materials Laboratory	0	0	3	1.5
9	20BE2101	MC	Environmental Science	2	0	0	0
				Total	17	3	9
							22.5

II Year II Semester

S. N o	Course Code	Course Category	Course Title	L	T	P	Credit s
1	20MM2201	PCC	Transport Phenomena in Materials	3	0	0	3
2	20MM2202	PCC	Iron making Technology	3	0	0	3
3	20MM2203	PCC	Metal Forming	3	0	0	3
4	20MM2204	PCC	Corrosion Engineering	3	0	0	3
5	20MM2205	PCC	Science and Technology of Ceramics	3	0	0	3
6	20XX22XX	OEC	Open Elective Course - 2	3	0	0	3
7	20MM2281	PCC	Metal Forming Laboratory	0	0	3	1.5
8	20MM2282	PCC	Corrosion Engineering Laboratory	0	0	3	1.5
				Total	18	0	9
							21



III Year I Semester

S. No	Course Code	Course Category	Course Title	L	T	P	Credits
1	20MM3101	PCC	Materials Characterization	3	1	0	4
2	20MM3102	PCC	Solidification Process and Casting	3	1	0	4
3	20MM3103	PCC	Non-Ferrous Extractive Metallurgy	3	0	0	3
4	20MM3104	PCC	Semiconductor Materials	3	0	0	3
5	20MM3105	PCC	Steel Making Technology	3	0	0	3
6	20MM3181	PCC	Materials Characterization Laboratory	0	0	3	1.5
7	20MM3182	PCC	Solidification Process and Casting Laboratory	0	0	3	1.5
8	20EG3182	HSC	English Language Communication Skills Lab-II	0	0	3	1.5
9		MC	Gender sensitization	2	0	0	0
Total				17	2	9	21.5

III Year II Semester

S. N o	Course Code	Course Categor y	Course Title	L	T	P	Credits
1	20MM3201	PCC	Metal Joining and Non-Destructive Testing	3	1	0	4
2	20MM3202	PCC	Computational Materials Engineering	3	0	0	3
3	20MM32XX	PEC	Professional Elective Course - 1	3	0	0	3
4	20MM3281	PCC	Metal Joining and Non-Destructive Testing Lab	0	0	3	1.5
5	20MM3282	PCC	Computational Materials Engineering Lab	0	0	3	1.5
6	20MM3291	PROJ	Minor Project	0	0	4	2
7	20EG3282	HSC	English Language Communication Skills Lab-III	0	0	3	1.5
Total				9	1	13	16.5

S. No	Course Code	Course Category	Course Title	L	T	P	Credits
1	20MM3292	SI	Summer Internship (6-8 Weeks)	0	0	0	2.5

IV Year I Semester



S. N o	Course Code	Course Categor y	Course Title	L	T	P	Credits
1	20BM4101	HSC	Managerial Economics & Financial Analysis	3	0	0	3
2	20MM4191	PROJ	Major Project -1	0	0	8	4
3	20MM41XX	PEC	Professional Elective Course – 2	3	0	0	3
4	20MM41XX	PEC	Professional Elective Course – 3	3	0	0	3
5	20YY41XX	OEC	Open Elective Course- 2	3	0	0	3
				Total	1 2	0	8 16

IV Year II Semester

S. N o	Course Code	Course Categor y	Course Title	L	T	P	Credits
1	20MM4291	PROJ	Major Project – 2	0	0	8	4
2	20MM42XX	PEC	Professional Elective Course – 4	3	0	0	3
3	20YY42XX	OEC	Open Elective Course- 3	3	0	0	3
4	20YY42XX	OEC	Open Elective Course- 4	3	0	0	3
5	20HS4299	MC	Indian Community Services	0	0	0	2
				Total	9	0	8 15



List of Professional Elective Courses

Course Category	Course Code	Course Title	Credits
Professional Elective Course – 1			
PEC	20MM3203	Electronic and Magnetic Properties of Materials	3
PEC	20MM3204	Polymer Product design	3
PEC	20MM3205	Soft Materials	3
PEC	20MM3206	Advanced Materials and processes	3
PEC	20MM3207	Powder Metallurgy	3
PEC	20MM3208	Secondary Steel Making	3
Professional Elective Course – 2			
PEC	20MM4101	Foundations of Computational Materials Modelling	3
PEC	20MM4102	Nanomaterials – Synthesis and applications	3
PEC	20MM4103	Introduction to Crystallographic texture and related phenomenon	3
PEC	20MM4104	Surface Science and Engineering	3
PEC	20MM4105	Light Metals and Alloys	3
PEC	20MM4106	Melt Treatment in Casting	3
Professional Elective Course – 3			
PEC	20MM4107	Composite Materials	3
PEC	20MM4108	Finite element method in Materials Engineering	3
PEC	20MM4109	Ceramic coatings	3
PEC	20MM4110	Introduction to Crystal Elasticity and Crystal Plasticity	3
PEC	20MM4111	Super Alloys	3
PEC	20MM4112	Fuels Furnaces Refractories	3
Professional Elective Course – 4			
PEC	20MM4201	Thermo mechanical and Thermo Chemical processing	3
PEC	20MM4202	Nuclear Materials	3
PEC	20MM4203	Polymer blends and alloys	3
PEC	20MM4204	Welding Metallurgy	3
PEC	20MM4205	Additive Manufacturing	3
PEC	20MM4206	Fracture Mechanics and Failure Analysis	3
Apart from the above listed subjects, any NPTEL/SWAYAM Course in related to Metallurgical and Materials Engineering can be offered as Professional Elective Course.			



List of Open Elective Courses

Open Elective Courses (POOL-A)

Course Category	Course Title	Credits
OEC	Biomaterials	3
OEC	Composite Materials	3
OEC	Diffusion in solids	3
OEC	Electron Microscopy	3
OEC	Energy Storage Materials	3
OEC	Nano materials	3
OEC	Nuclear Materials	3
OEC	Semiconductor Materials	3
OEC	Material Aspects in Design	3
OEC	Creep and Fatigue Behavior of Materials	3
Apart from the above listed subjects, any NPTEL/SWAYAM Course in related to Metallurgical and Materials Engineering can be offered as Open Elective Course.		

Open Elective Courses (POOL-B)

Course Category	Course Title	Credits
OEC	Biology for Engineers	3
OEC	Soft Skills and Interpersonal Communication	3
OEC	Economic Policies in India	3
OEC	Human Resource Development & Organization behavior	3
OEC	Indian Music System	3
OEC	Intellectual Property Rights (IPR)	3
*At-least two courses must be taken from Open Elective Courses present in POOL-B		

**** Completion of courses through MOOCs is subjected to the regulations and guidelines of the University/Institute from time to time.**

H. Minor Engineering programmes

Minor Course -1: Materials Science for Additive Manufacturing

S. No	Course Code	Course Category	Course Title	L	T	P	Credits
1	20MMM101	PCC	Science and Engineering of Materials	3	1	0	4
2	20MMM102	PCC	Additive Manufacturing Processes	3	0	0	3
3	20MMM103	PCC	Materials, Energy Sources and Bonding Mechanisms	3	0	0	3
4	20MMM104	PCC	Mechanical Behaviour and Testing of Materials	3	0	0	3
5	20MMM105	PCC	Materials Characterization	3	1	0	4
6	20MMM1XX	PEC	Professional Electives -1	3	0	0	3
Total				1 8	2	0	20

Professional Elective Course – 1

Course Category	Course Code	Course Title	Credits
PEC	20MMM106	Science and Technology of Polymer	3
PEC	20MMM107	Powder Metallurgy	3
PEC	20MMM108	Nanomaterials – Synthesis and applications	3
PEC	20MMM109	Surface Science and Engineering	3
PEC	20MMM110	Composite Materials	3
PEC	20MMM111	Energy Storage Materials	3

Minor Course -2: Materials Testing

S. No	Course Code	Course Category	Course Title	L	T	P	Credits
1	20MMM201	PCC	Structure and Properties of Materials	3	0	0	3
2	20MMM202	PCC	Mechanical Testing of Materials	3	1	0	4
3	20MMM203	PCC	Non-Destructive Testing	3	0	0	3
4	20MMM204	PCC	Materials Characterization	3	1	0	4
5	20MMM205	PCCL	Materials Testing Laboratory-1	0	0	3	1.5
6	20MMM206	PCCL	Materials Testing Laboratory -2	0	0	3	1.5
7	20MMM2XX	PEC	Professional Electives -1	3	0	0	3
Total				1 5	2	6	20

Professional Elective Course – 1



Course Category	Course Code	Course Title	Credits
PEC	20MMM207	Advanced Characterization Techniques	3
PEC	20MMM208	Electron Microscopy	3
PEC	20MMM209	Modern Instrumental Methods of Analysis	3
PEC	20MMM210	Metallurgical Failure Analysis	3
PEC	20MMM211	Fracture Mechanics	3
PEC	20MMM213	Creep and Fatigue Behaviour of Materials	3

Minor Course -3: Materials Processing and Manufacturing

S. No	Course Code	Course Category	Course Title	L	T	P	Credits
1	20MMM301	PCC	Introduction to Materials Science and Engineering	3	1	0	4
2	20MMM302	PCC	Heat Treatment and Surface Engineering	3	0	0	3
3	20MMM303	PCC	Solidification Process and Casting	3	1	0	4
4	20MMM304	PCC	Metal Joining Technology	3	0	0	3
5	20MMM305	PCC	Metal Forming	3	0	0	3
6	20MMM306	PCC	Powder Metallurgy	3	0	0	3
Total				18	2	0	20

Minor Course -4: Advanced Materials Technology

S. N o	Course Code	Course Category	Course Title	L	T	P	Credits
1	20MMM401	PCC	Elements of Materials Science and Metallurgy	3	1	0	4
2	20MMM402	PCC	Advanced Materials and Processes	3	1	0	4
3	20MMM403	PCC	Advanced Ceramics and Glass	3	0	0	3
4	20MMM404	PCC	Nanomaterials Synthesis and Processing	3	0	0	3
5	20MMM405	PCC	Science and Technology of Composite Materials	3	0	0	3
6	20MMM406	PCC	Processing of Semi-Conducting Materials	3	0	0	3
Total				18	2	0	20