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

General, Course structure, Semester-wise credit distribution

A. Total number of credits: 160

B. 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 Project/Major Project/Seminar
SI	Summer Internship

C. 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**

D. Semester-wise Credits Distribution

	TOTAL	E1-S1	E1-S2	E2-S1	E2-S2	E3-S1	E3-S2	E4-S1	E4-S2
BSC	15	7.5	7.5	0	0	0	0	0	0
ESC	22	11.5	4.5	3	3	0	0	0	0
HSMC	8.5	2.5	0	0	0	1.5	4.5	0	0
PCC	72	0	7.5	16.5	18	18	12	0	0
PEC	12	0	0	0	0	0	0	3	6
OEC	9	0	0	0	3	0	0	3	6
MC	2	0	0	0	0	0	0	0	2
PROJ	16	0	0	0	0	3	3	5	5

SUMMER INTERNSHIP	3.5	0	0	0	0	0	3.5	0	0
	160	**21.5**	**19.5**	**19.5**	**24**	**22.5**	**23**	**11**	**19**

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

E. Definition of Credit:

1 Hour Lecture (L) per week	1 credit
1 Hour Tutorial (T) per week	0 credit
3 Hours Practical (Lab)/week	1.5 credits

F. 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. No	Course Code	Course Category	Course Title	L	T	P	Credits
1	23MA1101	BSC	Differential Equations and Multivariable Calculus	3	1	0	3
2	23PY1103	BSC	Engineering Physics	3	1	0	3
3	23CE1114	ESC	Engineering Graphics and Computer Drafting	1	0	3	2.5
4	23ME1113	ESC	Engineering Mechanics	3	1	0	3
5	23CS1108	ESC	Programming and Data Structures	3	1	0	3
6	23EG1181	HSC	English Language Communication Skills Lab-I	1	0	3	2.5
7	23PY1183	BSC	Engineering Physics Laboratory	0	0	3	1.5
8	23CS1188	ESC	Programming and Data Structures Laboratory	0	0	3	1.5
9	23ME1186	ESC	Workshop Manufacturing Practices	0	0	3	1.5
			Total	**14**	**4**	**15**	**21.5**

I Year II Semester

S. No	Course Code	Course Category	Course Title	L	T	P	Credits
1	23MA1201	BSC	Mathematical Methods	3	1	0	3
2	23CY1204	BSC	Engineering Chemistry	3	1	0	3
3	23EE1209	ESC	Basic Electrical and Electronics Engineering	3	1	0	3
4	23MM1201	PCC	Materials Thermodynamics	3	1	0	3
5	23MM1202	PCC	Physical Metallurgy	3	1	0	3
6	23CY1284	BSC	Engineering Chemistry Laboratory	0	0	3	1.5
7	23EE1289	ESC	Basic Electrical & Electronics Engineering Laboratory	0	0	3	1.5
8	23MM1281	PCC	Physical Metallurgy and Metallography Laboratory	0	0	3	1.5
9	23HS1201	MC	Indian Constitution	2	0	0	0
			Total	**17**	**5**	**9**	**19.5**

II Year I Semester

S. No	Course Code	Course Category	Course Title	L	T	P	Credits
1	23MM2101	PCC	Mineral Processing and Extractive Metallurgy	3	1	0	3
2	23MM2102	PCC	Phase Transformations and Heat Treatment	3	1	0	3
3	23MM2103	PCC	Mechanical Behaviour and Testing of Materials	3	1	0	3
4	23MM2104	PCC	Engineering Polymers	3	1	0	3
5	23MM2181	PCC	Mineral Processing and Extractive Metallurgy Laboratory	0	0	3	1.5
6	23MM2182	PCC	Phase Transformations and Heat Treatment Laboratory	0	0	3	1.5
7	23MM2183	PCC	Mechanical Behaviour and Testing of Materials Laboratory	0	0	3	1.5
8	23CS21XX	ESC	Programming in Java	3	1	0	3
9	23BE2101	MC	Environmental Science	2	0	0	0
			Total	**17**	**5**	**9**	**19.5**

II Year II Semester

S. No	Course Code	Course Category	Course Title	L	T	P	Credits
1	23MM2201	PCC	Transport Phenomena in Materials	3	1	0	3
2	23MM2202	PCC	Iron making Technology	3	1	0	3
3	23MM2203	PCC	Metal Forming	3	1	0	3
4	23MM2204	PCC	Corrosion Engineering	3	1	0	3
5	23MM2205	PCC	Science and Technology of Ceramics	3	1	0	3
6	23MM2281	PCC	Metal Forming Laboratory	0	0	3	1.5
7	23MM2282	PCC	Corrosion Engineering Laboratory	0	0	3	1.5
8	23CS22XX	ESC	Database Management System	3	1	0	3
9	23HS22XX	MC	Gender sensitization	2	0	0	0
			Total	**20**	**6**	**6**	**21**

III Year I Semester

S. No	Course Code	Course Category	Course Title	L	T	P	Credits
1	23MM3101	PCC	Materials Characterization	3	1	0	3
2	23MM3102	PCC	Solidification Process and Casting	3	1	0	3
3	23MM3103	PCC	Non-Ferrous Extractive Metallurgy	3	1	0	3
4	23MM3104	PCC	Semiconductor Materials	3	1	0	3
5	23MM3105	PCC	Steel Making Technology	3	1	0	3
6	23MM3181	PCC	Materials Characterization Laboratory	0	0	3	1.5
7	23MM3182	PCC	Solidification Process and Casting Laboratory	0	0	3	1.5
8	23EG3182	HSC	English Language Communication Skills Lab-II	0	0	3	1.5
7	23MM3191	PROJ	Minor Project-2	0	0	6	3
			Total	**15**	**5**	**15**	**19.5**

III Year II Semester

S. No	Course Code	Course Category	Course Title	L	T	P	Credits
1	23MM3201	PCC	Metal Joining and Non-Destructive Testing	3	1	0	3
2	23MM3202	PCC	Computational Methods for Materials Engineering	3	1	0	3
3	23MM3203	PCC	Processing of Polymer, Ceramics and Composites	3	1	0	3
4	23MM32XX	PEC	Professional Elective Course - 1	3	1	0	3
5	23MM3281	PCC	Metal Joining and Non-Destructive Testing Lab	0	0	3	1.5
6	23MM3282	PCC	Computational Materials Engineering Lab	0	0	3	1.5
7	23MM3291	PROJ	Minor Project-1	0	0	6	3
8	23EG3283	HSC	English Language Communication Skills Lab-III	0	0	3	1.5
9	23BM32XX	HSC	Managerial Economics & Financial Analysis	3	1	0	3
			Total	**15**	**5**	**15**	**22.5**

S. No	Course Code	Course Category	Course Title	L	T	P	Credits
1	23MM3292	SI	Summer Internship (6-8 Weeks)	0	0	7	3.5

IV Year I Semester

S. No	Course Code	Course Category	Course Title	L	T	P	Credits
1	23MM4191	PROJ	Major Project -1	0	0	10	5
2	23MM41XX	PEC	Professional Elective Course – 2	3	1	0	3
3	23MM41XX	PEC	Professional Elective Course – 3	3	1	0	3
4	23YY41XX	OEC	Open Elective Course- 1	3	1	0	3
5	23MM4192	PROJ	Industrial Lecture	2	0	0	0
			Total	**11**	**3**	**10**	**14**

IV Year II Semester

S. No	Course Code	Course Category	Course Title	L	T	P	Credits
1	23MM4291	PROJ	Major Project – 2	0	0	10	5
2	23MM42XX	PEC	Professional Elective Course – 4	3	1	0	3
3	23YY42XX	OEC	Open Elective Course- 2	3	1	0	3
4	23YY42XX	OEC	Open Elective Course- 3	3	1	0	3
5	23HS4299	MC	Indian Community Services	0	0	4	2
			Total	**9**	**3**	**14**	**16**

List of Professional Elective Courses

Course Category	Course Code	Course Title	Credits
Professional Elective Course – 1			
PEC	23MM3203	Electronic and Magnetic Properties of Materials	3
PEC	23MM3204	Polymer Product design	3
PEC	23MM3205	Soft Materials	3
PEC	23MM3206	Advanced Materials and processes	3
PEC	23MM3207	Powder Metallurgy	3
PEC	23MM3208	Secondary Steel Making	3
Professional Elective Course – 2			
PEC	23MM4101	Foundations of Computational Materials Modelling	3
PEC	23MM4102	Nanomaterials and Nanotechnology	3
PEC	23MM4103	Introduction to Crystallographic texture and related phenomenon	3
PEC	23MM4104	Surface Science and Engineering	3
PEC	23MM4105	Light Metals and Alloys	3
PEC	23MM4106	Melt Treatment in Casting	3
Professional Elective Course – 3			
PEC	23MM4107	Composite Materials	3

PEC	23MM4108	Finite element method in Materials Engineering	3
PEC	23MM4109	Ceramic coatings	3
PEC	23MM4110	Introduction to Crystal Elasticity and Crystal Plasticity	3
PEC	23MM4111	Super Alloys	3
PEC	23MM4112	Fuels Furnaces Refractories	3
Professional Elective Course – 4			
PEC	23MM4201	Thermo mechanical and Thermo Chemical processing	3
PEC	23MM4202	Nuclear Materials	3
PEC	23MM4203	Polymer blends and alloys	3
PEC	23MM4204	Welding Metallurgy	3
PEC	23MM4205	Additive Manufacturing	3
PEC	23MM4206	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

Course Category	Course Code	Course Title	Credits
OEC	23CSXXXX	Programming, Data Structures and Algorithms in Python	3
OEC	23CSXXXX	Programming in C++	3
OEC	23CSXXXX	Data Science for Engineers	3
OEC	23CSXXXX	Introduction to Machine Learning	3
OEC	23CSXXXX	Introduction to Internet of Things	3
OEC	23MMXX51	Numerical Methods for Engineers	3
OEC	23MMXX52	Basics of Finite Element Analysis	3
OEC	23MMXX53	Optimization from fundamentals	3
OEC	23MMXX54	Tools in Scientific Computing	3
OEC	23MMXX55	Environmental Quality Monitoring & Analysis	3
OEC	23MMXX56	Non-Conventional Energy Resources	3
OEC	23MMXX57	Basic environmental engineering and Pollution abatement	3
OEC	23MMXX58	Waste to Energy Conversion	3
OEC	23MMXX59	Electrochemical Energy Storage	3
OEC	23MMXX60	Biomaterials	3
OEC	23MMXX61	Composite Materials	3
OEC	23MMXX62	Diffusion in solids	3
OEC	23MMXX63	Electron Microscopy	3
OEC	23MMXX64	Energy Storage Materials	3

OEC	23MMXX65	Nano materials	3
OEC	23MMXX66	Nuclear Materials	3
OEC	23MMXX67	Semiconductor Materials	3
OEC	23MMXX68	Material Aspects in Design	3
OEC	23MMXX69	Creep and Fatigue Behavior of Materials	3
OEC	23MAXXXX	Probability and Statistics	3
OEC	23MAXXXX	Transform Calculus	3
OEC	23YYXXXX	Biology for Engineers	3
OEC	23YYXXXX	Soft Skills and Interpersonal Communication	3
OEC	23YYXXXX	Economic Policies in India	3
OEC	23YYXXXX	Human Resource Development & Organization behavior	3
OEC	23YYXXXX	Indian Music System	3
OEC	23YYXXXX	Intellectual Property Rights (IPR)	3

**** 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	23MMM101	PCC	Science and Engineering of Materials	3	1	0	3
2	23MMM102	PCC	Additive Manufacturing Processes	3	1	0	3
3	23MMM103	PCC	Materials, Energy Sources and Bonding Mechanisms	3	1	0	3
4	23MMM104	PCC	Mechanical Behaviour and Testing of Materials	3	1	0	3
5	23MMM105	PCC	Materials Characterization	3	1	0	3
6	23MMM1XX	PEC	Professional Electives -1	3	1	0	3
7	23MMM1XX	PEC	Professional Electives -2	3	1	0	3
			Total	**21**	**7**	**0**	**21**

Professional Elective Course for Materials Science for Additive Manufacturing

Course Category	Course Code	Course Title	Credits
PEC	23MMM106	Science and Technology of Polymer	3
PEC	23MMM107	Powder Metallurgy	3
PEC	23MMM108	Nanomaterials – Synthesis and applications	3
PEC	23MMM109	Surface Science and Engineering	3
PEC	23MMM110	Composite Materials	3
PEC	23MMM111	Energy Storage Materials	3

Minor Course -2: Materials Testing

S. No	Course Code	Course Category	Course Title	L	T	P	Credits
1	23MMM201	PCC	Structure and Properties of Materials	3	1	0	3
2	23MMM202	PCC	Mechanical Testing of Materials	3	1	0	3
3	23MMM203	PCC	Non-Destructive Testing	3	1	0	3
4	23MMM204	PCC	Materials Characterization	3	1	0	3
5	23MMM205	PCCL	Materials Testing Laboratory-1	0	0	3	1.5
6	23MMM206	PCCL	Materials Testing Laboratory -2	0	0	3	1.5
7	23MMM2XX	PEC	Professional Electives -1	3	1	0	3
8	23MMM2XX	PEC	Professional Electives -2	3	1	0	3
			Total	**16**	**6**	**6**	**21**

Professional Elective Course for Materials Testing

Course Category	Course Code	Course Title	Credits
PEC	23MMM207	Advanced Characterization Techniques	3
PEC	23MMM208	Electron Microscopy	3
PEC	23MMM209	Modern Instrumental Methods of Analysis	3
PEC	23MMM210	Metallurgical Failure Analysis	3
PEC	23MMM211	Fracture Mechanics	3
PEC	23MMM212	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	23MMM301	PCC	Introduction to Materials Science and Engineering	3	1	0	3
2	23MMM302	PCC	Heat Treatment and Surface Engineering	3	1	0	3
3	23MMM303	PCC	Solidification Process and Casting	3	1	0	3
4	23MMM304	PCC	Metal Joining Technology	3	1	0	3
5	23MMM305	PCC	Metal Forming	3	1	0	3
6	23MMM306	PCC	Powder Metallurgy	3	1	0	3
7	23MMM307	PCC	Surface Science and Engineering	3	1	0	3
			Total	**21**	**7**	**0**	**21**

Minor Course -4: Advanced Materials Technology

S. No	Course Code	Course Category	Course Title	L	T	P	Credits
1	23MMM401	PCC	Elements of Materials Science and Metallurgy	3	1	0	4
2	23MMM402	PCC	Advanced Materials and Processes	3	1	0	4
3	23MMM403	PCC	Advanced Ceramics and Glass	3	1	0	3
4	23MMM404	PCC	Nanomaterials Synthesis and Processing	3	1	0	3
5	23MMM405	PCC	Science and Technology of Composite Materials	3	1	0	3
6	23MMM406	PCC	Thermo-Mechanical and Thermo-Chemical Processes	3	1	0	3
7	23MMM407	PCC	Processing of Semi-Conducting Materials	3	1	0	3
			Total	**21**	**7**	**0**	**21**