Dr. Babasaheb Ambedkar Technological University (Established as University of Technology in the State of Maharashtra)
(Under Maharashtra Act No. XXIX of 2014)
P.O. Lonere, Dist. Raigad, Pin 402 103,
Maharashtra Telephone and Fax. 02140 - 275142
www.dbatu.ac.in

PROPOSED CURRICULUM

UNDER GRADUATE PROGRAMME

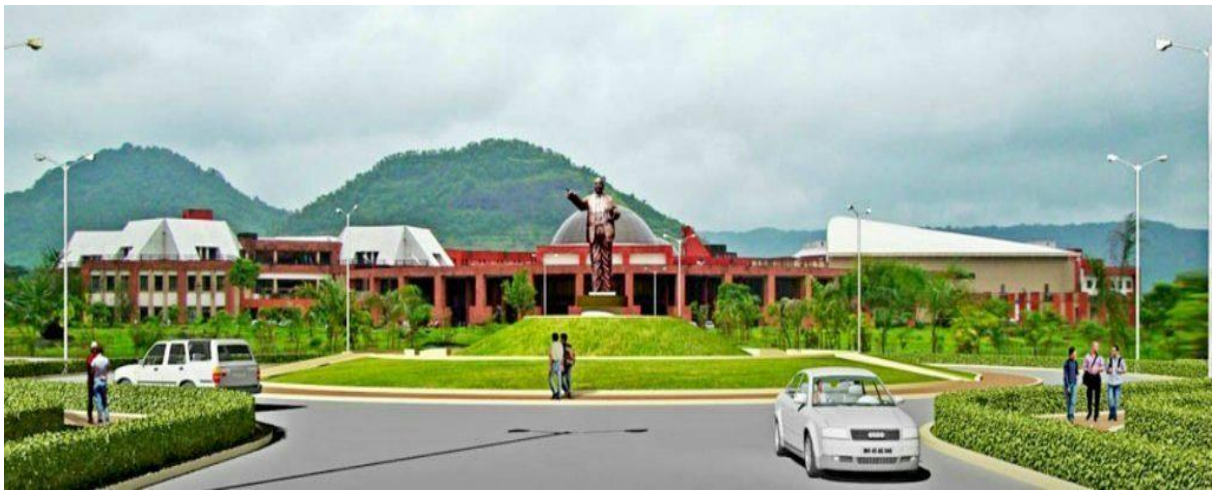
B. TECH

MECHANICAL AND AUTOMATION ENGINEERING

B. Tech Third & Final Year

2024-2025

(AFFILIATED INSTITUTES)



Vision

The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students.

Mission

Imparting quality education, looking after holistic development of students and conducting need based research and extension.

Graduate Attributes

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Educational Objectives

PEO1	Graduates should excel in engineering positions in industry and other organizations that emphasize design and implementation of engineering systems and devices.
PEO2	Graduates should excel in best post-graduate engineering institutes, reaching advanced degrees in engineering and related discipline.
PEO3	Within several years from graduation, alumni should have established a successful career in an engineering-related multidisciplinary field, leading or participating effectively in interdisciplinary engineering projects, as well as continuously adapting to changing technologies.
PEO4	Graduates are expected to continue personal development through professional study and self-learning.
PEO5	Graduates are expected to be good citizens and cultured human beings, with full appreciation of the importance of professional, ethical and societal responsibilities.

Program Outcomes

At the end of the program the student will be able to:

PO1	Apply knowledge of mathematics, science and engineering to analyze, design and evaluate mechanical components and systems using state-of-the-art IT tools.
PO2	Analyze problems of production engineering including manufacturing and industrial systems to formulate design requirements.
PO3	Design, implement and evaluate production systems and processes considering public health, safety, cultural, societal and environmental issues.
PO4	Design and conduct experiments using domain knowledge and analyze data to arrive at valid conclusions.
PO5	Apply current techniques, skills, knowledge and computer based methods and tools to develop production systems.
PO6	Analyze the local and global impact of modern technologies on individual organizations, society and culture.
PO7	Apply knowledge of contemporary issues to investigate and solve problems with a concern for sustainability and eco-friendly environment.
PO8	Exhibit responsibility in professional, ethical, legal, security and social issues.
PO9	Function effectively in teams, in diverse and multidisciplinary areas to accomplish common goals.
PO10	Communicate effectively in diverse groups and exhibit leadership qualities.
PO11	Apply management principles to manage projects in multidisciplinary environment.
PO12	Pursue life-long learning as a means to enhance knowledge and skills.

Rules and Regulations

1. The normal duration of the course leading to B.Tech degree will be EIGHT semesters.
2. The normal duration of the course leading to M.Tech. degree will be FOUR semesters.
3. Each academic year shall be divided into 2 semesters, each of 20 weeks duration, including evaluation and grade finalization, etc. The Academic Session in each semester shall provide for at least 90 Teaching Days, with at least 40 hours of teaching contact periods in a five to six days session per week. The semester that is typically from Mid-July to November is called the ODD SEMESTER, and the one that is from January to Mid-May is called the EVEN SEMESTER. Academic Session may be scheduled for the Summer Session/Semester as well. For 1st year B. Tech and M. Tech the schedule will be decided as per the admission schedule declared by Government of Maharashtra.

4. The schedule of academic activities for a Semester, including the dates of registration, mid-semester examination, end-semester examination, inter-semester vacation, etc. shall be referred to as the Academic Calendar of the Semester, which shall be prepared by the Dean (Academic), and announced at least TWO weeks before the Closing Date of the previous Semester.
5. The Academic Calendar must be strictly adhered to, and all other activities including co-curricular and/or extra -curricular activities must be scheduled so as not to interfere with the Curricular Activities as stipulated in the Academic Calendar.

REGISTRATION:

1. Lower and Upper Limits for Course Credits Registered in a Semester, by a Full-Time Student of a UG/PG Programme:

A full time student of a particular UG/PG programme shall register for the appropriate number of course credits in each semester/session that is within the minimum and maximum limits specific to that UG/PG programme as stipulated in the specific Regulations pertaining to that UG/PG programme.

2. Mandatory Pre-Registration for higher semesters:
   In order to facilitate proper planning of the academic activities of a semester, it is essential for the every institute to inform to Dean (Academics) and COE regarding details of total no. of electives offered (Course-wise) along with the number of students opted for the same. This information should be submitted within two weeks from the date of commencement of the semester as per academic calendar.
3. PhD students can register for any of PG/PhD courses and the corresponding rules of evaluation will apply.
4. Under Graduate students may be permitted to register for a few selected Post Graduate courses, in exceptionally rare circumstances, only if the DUGC/DPGC is convinced of the level of the academic achievement and the potential in a student.

Course Pre-Requisites:

1. In order to register for some courses, it may be required either to have exposure in, or to have completed satisfactorily, or to have prior earned credits in, some specified courses.
2. Students who do not register on the day announced for the purpose may be permitted LATE REGISTRATION up to the notified day in academic calendar on payment of late fee.

3. REGISTRATION IN ABSENTIA will be allowed only in exceptional cases with the approval of the Dean (Academic) / Principal.
4. A student will be permitted to register in the next semester only if he fulfills the following conditions:

(a) Satisfied all the Academic Requirements to continue with the programme of Studies without termination
(b) Cleared all Institute, Hostel and Library dues and fines (if any) of the previous semesters;
(c) Paid all required advance payments of the Institute and hostel for the current semester;
(d) Not been debarred from registering on any specific ground by the Institute.

EVALUATION SYSTEM:

1. Absolute grading system based on absolute marks as indicated below will be implementeds from academic year 2019-20,starting from I year B.Tech.

Perentage of marks	Letter grade	Grade point
91-100	EX	10.0
86-90	AA	9.0
81-85	AB	8.5
76-80	BB	8.0
71-75	BC	7.5
66-70	CC	7.0
61-65	CD	6.5
56-60	DD	6.0
51-55	DE	5.5
40-50	EE	5.0
<40	EF	0.0

2. Class is awdared based on CGPA of all eigth semster of B.Tech Program.

CGPA for pass is minimum 5.0	
CGPAupto<5.50	Pass class
CGPA ≥ 5.50 &<6.00	SecondClass
CGPA ≥ 6.00 &<7.50	First Class
CGPA ≥ 7.50	Distinction
[Percentage of Marks =CGPA*10.0]	

A total of 100 Marks for each theory course are distributed as follows:

	MidSemester Exam (MSE) Marks	20
	ContinuousAssesment Marks	20
	End SemesterExamination(ESE)Marks	60

4.A total of 100 Marks for each practical course are distributed as follows:

1.	Continuous Assesment Marks	60
2.	End Semester Examination (ESE)Marks	40

It is mandatory for every student of B.Tech. to score a minimum of 40 marks out of 100, with a minimum of 20 marks out of 60 marks in End Semester Examination for theory course.

This will be implemented from the first year of B.Tech starting from Academic Year 2019-20

5. Description of Grades:

EX Grade: An 'EX' grade stands for outstanding achievement.
EE Grade: The 'EE' grade stands for minimum passing grade.
The students may appear for the remedial examination for the subjects he/she failed for the current semester of admission only and his/her performance will be awarded with EE grade only.
If any of the student remain Absent for the regular examination due to genuine reason and the same will be verified and tested by the Dean (Academics) or committee constituted by the University Authority.
FF Grade: The 'FF' grade denotes very poor performance, i.e. failure in a course due to poor performance .The students who have been awarded 'FF' grade in a course in any semester must repeat the subject in next semester.

6. Evaluation of Performance:

1. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)

(A) Semester Grade Point Average (SGPA) The performance of a student in a semester is indicated by Semester Grade Point Average (SGPA) which is a weighted average of the grade points obtained in all the courses taken by the student in the semester and scaled to a maximum of 10. (SGPI is to be calculated up to two decimal places). A Semester Grade Point Average (SGPA) will be computed for each semester as follows:

$$SGPA = \frac{[\sum_{i=1}^{n} c_i\, g_i]}{[\sum_{i=1}^{n} c_i\,]}$$

Where
'n' is the number of subjects for the semester,
'ci' is the number of credits allotted to a particular subject, and
'gi' is the grade-points awarded to the student for the subject based on his performance as
per the above table.
-SGPA will be rounded off to the second place of decimal and recorded as such.

(B) Cumulative Grade Point Average (CGPA): An up to date assessment of the overall performance of a student from the time he entered the Institute is obtained by calculating Cumulative Grade Point Average (CGPA) of a student. The CGPA is weighted average of the grade points obtained in all the courses registered by the student since s/he entered the Institute. CGPA is also calculated at the end of every semester (up to two decimal places).Starting from the first semester at the end of each semester (S), a Cumulative Grade Point Average (CGPA) will be computed as follows:

$$CGPA = \frac{[\sum_{i=1}^{m} c_i\, g_i]}{[\sum_{i=1}^{m} c_i\,]}$$

Where
'm' is the total number of subjects from the first semester onwards up to and including the semester S,
'ci' is the number of credits allotted to a particular subject, and
'gi' is the grade-points awarded to the student for the subject based on his/her performance as per the above table.

-CGPA will be rounded off to the second place of decimal and recorded as such.

Award of Degree of Honours

Major Degree

The concept of Major and Minors at B.Tech level is introduced , to enhance learning skills of students, acquisition of additional knowledge in domains other than the discipline being pursued by the student, to make the students better employable with additional knowledge and encourage students to pursue cross-discipline research.

A. Eligibility Criteria for Majors

1. The Student should have Minimum CGPA of 7.5 up to 4th Semester
2. Student willing to opt for majors has to register at the beginning of 5th Semester
3. The Student has to complete 5 additional advanced courses from the same discipline specified in the curriculum. These five courses should be of 4 credits each amounting

to 20 credits. The students should complete these credits before the end of last semester.

4. Student may opt for the courses from NPTEL/ SWAYAM platform. (if the credits of NPTEL/ SWAYAM courses do not match with the existing subject proper scaling will be done)

Student complying with these criteria will be awarded B.Tech (Honours) Degree.

B. Eligibility Criteria for Minors

1. The Student should have Minimum CGPA of 7.5 up to 4th Semester
2. Student willing to opt for minors has to register at the beginning of 5th Semester
3. The Student has to complete 5 additional courses from other discipline of their interest, which are specified in the respective discipline. These five courses should be of 4 credits each amounting to 20 credits.
4. Student may opt for the courses from NPTEL/ SWAYAM platform. (if the credits of NPTEL/ SWAYAM courses do not match with the existing subject proper scaling will be done)

Student complying with these criteria will be awarded with B.Tech Degree in -------Engineering with Minor in ------ --Engineering.
(For e.g.: B. Tech in Civil Engineering with Minor in Computer Engineering)

For applying for Honours and Minor Degree the student has to register themselves through the proper system.

ATTENDANCE REQUIREMENTS:

1. All students must attend every lecture, tutorial and practical classes.
2. To account for approved leave of absence (eg. representing the Institute in sports, games or athletics; placement activities; NCC/NSS activities; etc.) and/or any other such contingencies like medical emergencies, etc., the attendance requirement shall be a minimum of 75% of the classes actually conducted.
   If the student failed to maintain 75% attendance, he/she will be detained for appearing the successive examination.
   The Dean (Academics)/ Principal is permitted to give 10% concession for the genuine reasons as such the case may be.
   In any case the student will not be permitted for appearing the examination if the attendance is less than 65%.
3. The course instructor handling a course must finalize the attendance 3 calendar days before the last day of classes in the current semester and communicate clearly to the students by displaying prominently in the department and also in report writing to the head of the department concerned.
4. The attendance records are to be maintained by the course instructor and he shall show it to the student, if and when required.

TRANSFER OF CREDITS

The courses credited elsewhere, in Indian or foreign University/Institutions/ Colleges/Swayam Courses by students during their study period at DBATU may count towards the credit requirements for the award of degree. The guidelines for such transfer of credits are as follows:

a) 20 % of the total credit will be considered for respective calculations.

b) Credits transferred will be considered for overall credits requirements of the programme.

c) Credits transfer can be considered only for the course at same level i.e UG, PG etc.

d) A student must provide all details (original or attested authentic copies)such as course contents, number of contact hours, course instructor /project guide and evaluation system for the course for which he is requesting a credits transfer. He shall also provide the approval or acceptance letter from the other side. These details will be evaluated by the concerned Board of Studies before giving approval. The Board of Studies will then decide the number of equivalent credits the student will get for such course(s) in DBATU. The complete details will then be forwarded to Dean for approval.

e) A student has to get minimum passing grades/ marks for such courses for which the credits transfers are to be made.

f) Credits transfers availed by a student shall be properly recorded on academic record(s) of the student.

g) In exceptional cases, the students may opt for higher credits than the prescribed.

Abbreviations

BSC: *Basic Science Course*

ESC: *Engineering Science Course*

PCC: *Professional Core Course*

PEC: *Professional Elective Course*

OEC: *Open Elective Course*

HSSMC: *Humanities and Social Science including Management Courses*

PROJ: *Project work, seminar and internship in industry or elsewhere*

Basic Science Course (BSC)		
BTBS101	Engineering Mathematics- I	(3-1-0)4
BTBS102	Engineering Physics	(3-1-0)4
BTBS107L	Engineering Physics Lab	(0-0-2)1
BTBS201	Engineering Mathematics-II	(3-1-0)4
BTBS202	Engineering Chemistry	(3-1-0)4
BTBS207L	Engineering Chemistry Lab	(0-0-2)1
BTBS301	Engineering Mathematics – III	(3-1-0)4
Engineering Science Course (ESC)		
BTES103	Engineering Graphics	(2-0-0)2
BTES105	Energy and Environment Engineering	(2-0-0)2
BTES106	Basic Civil & Mechanical Engineering	(2-0-0)Audit
BTES108L	Engineering Graphics Lab	(0-0-4)2
BTES203	Engineering Mechanics	(2-1-0)3
BTES204	Computer Programming	(3-0-0)3
BTES205	Basic Electrical and Electronics Engineering	(2-0-0)Audit
BTES206L	Workshop Practice	(0-0-4)2
BTES208L	Engineering Mechanics Lab	(0-0-2)1
BTMES304	Materials Science and Metallurgy	(3-1-0)4
BTMES404	Strength of Materials	(3-1-0)4
Online course	Artificial Intelligence*	(3-0-0)3
Humanities and Social Science Including Management Courses (HSSMC)		
BTHM104	Communication Skills	(2-0-0)2
BTHM109L	Communication Skills Lab	(0-0-2)1
BTHM403	Basic Human Rights	(3-0-0)3
BTHM702	Industrial Engineering and Management	(3-1-0)4
	Constitution of India*	(1-0-0)1
Professional Core Course (PCC)		
BTMC302	Fluid Mechanics	(3-1-0)4
BTMC303	Thermodynamics	(3-1-0)4
BTMCL305	Machine Drawing and CAD Lab	(0-0-4)2
BTMCL306	Mechanical Engineering Lab - I	(0-0-4) 2
BTMC401	Manufacturing Processes – I	(3-1-0)4
BTMC402	Theory of Machines-I	(3-1-0)4
BTMCL406	Mechanical Engineering Lab-II	(0-0-4) 2
BTMC 501	Heat Transfer	(3-1-0)4
BTMC 502	Machine Design – I	(3-1-0)4
BTMC 503	Theory of Machines- II	(3-1-0)4
BTMC506	Applied Thermodynamics	(3-1-0)4
BTMCL 507	Mechanical Engineering Lab - III	(0-0-6) 3
BTMC 601	Manufacturing Processes- II	(3-1-0)4
BTMC 602	Machine Design-II	(3-1-0)4
BTMCL 606	Mechanical Engineering Lab – IV	(0-0-6) 3
BTMC701	Mechatronics	(3-1-0)4
BTMCL706	Mechanical Engineering Lab –V	(0-0-6) 3
Professional Elective Course (PEC)		
BTMPE405A	Numerical Methods in Engineering	(3-1-0) 4
BTMPE405B	Sheet Metal Engineering	(3-1-0) 4
BTMPE405C	Fluid Machinery	(3-1-0) 4
BTMPE504A	Refrigeration and Air conditioning	(3-0-0)3
BTMPE504B	Steam and Gas Turbines	(3-0-0)3
BTMPE504C	Engineering Tribology	(3-0-0)3
BTAPE504A	Automobile Design	(3-0-0)3
BTAPE504D	Automobile Engineering	(3-0-0)3
BTMPE603A	IC Engines	(3-0-0)3
BTMPE603B	Mechanical Vibrations	(3-0-0)3

BTMPE603C	Machine Tool Design	(3-0-0)3
BTMPE603D	Engineering Metrology and Quality Control	(3-0-0)3
BTAPE603D	Automobile Body Design (Pre-requisite: Automobile Design)	(3-0-0)3
BTAPE603E	E – Vehicles	(3-0-0)3
BTMPE604A	Process Equipment Design	(3-0-0)3
BTMPE604B	Product Life Cycle Management	(3-0-0)3
BTMPE604C	Finite Element Method	(3-0-0)3
BTMPE604D	Robotics	(3-0-0)3
BTAPE604B	Computational Fluid Dynamics	(3-0-0)3
BTMPE703A	Design of Air Conditioning Systems	(3-0-0)3
BTMPE703B	Biomechanics	(3-0-0)3
BTMPE703C	Non-conventional Machining	(3-0-0)3
BTMPE703D	Advanced IC Engines	(3-0-0)3
BTMPE703E	Additive Manufacturing	(3-0-0)3
BTMPE703F	Surface Engineering	(3-0-0)3
BTPPE703D	Processing of Polymers	(3-0-0)3
Open Elective Course (OEC)		
BTMOE505A	Solar Energy	(3-0-0)3
BTMOE505B	Renewable Energy Sources	(3-0-0)3
BTMOE505C	Human Resource Management	(3-0-0)3
BTMOE505D	Product Design Engineering	(3-0-0)3
BTMOE605A	Quantitative Techniques and Project Management	(3-1-0) 4
BTMOE605B	Nanotechnology	(3-1-0) 4
BTMOE605C	Energy Conservation and Management	(3-1-0) 4
BTMOE605D	Wind Energy	(3-1-0) 4
BTMOE605E	Introduction to Probability Theory and Statistics	(3-1-0) 4

BTMOE704A	Sustainable Development	(3-0-0)3
BTMOE704B	Entrepreneurship Development	(3-0-0)3
BTMOE704C	Plant Maintenance	(3-0-0)3
BTMOE705A	Engineering Economics	(3-0-0)3
BTMOE705B	Biology for Engineers	(3-0-0)3
BTMOE705C	Intellectual Property Rights	(3-0-0)3
Seminar/Mini Project/ Internship		
BTES209P	IT – 1 Evaluation	(0-0-0)1
BTMI 407	IT – 2 Evaluation	(0-0-0) 1
BTMS607	B Tech Seminar	(0-0-2)1
BTMP 608	Mini Project (TPCS)	(0-0-2)2
BTMI609	IT – 3 Evaluation	(0-0-0)1
Project (MP)		
BTAP801/ BTAI801	Project work/ Internship	(0-0-24)12

Suggested Plan of Study

Number of Courses	Semester							
	I	II	III	IV	V	VI	VII	VIII
1	BTBS101 Engineering Mathematics - I	BTBS201 Engineering Mathematics- II	BTBS301 Engineering Mathematics – III	BTMC401 Manufacturing Processes – I	BTMC 501 Heat Transfer	BTMC 601 Manufacturing Processes- II	BTMC701 Mechatronics	BTMP801/ BTMI801 Project Work
2	BTBS102 Engineering Physics	BTBS202 Engineering Chemistry	BTMC302 Fluid Mechanics	BTMC402 Theory of Machines-I	BTMC 502 Machine Design – I	BTMC 602 Machine Design-II	BTHM702 Industrial Engineering and Management	--
3	BTES103 Engineering Graphics	BTES203 Engineering Mechanics	BTMC303 Thermodynamics	BTHM403 Basic Human Rights	BTMC 503 Theory of Machines- II	BTMPE 603A-D BTAPE 603C,E **(ElectiveIII)**	BTMPE703A-F BTPPE703D (Elective V)	--
4	BTHM104 Communication Skills	BTES204 Computer Programming	BTMES304 Materials Science and Metallurgy	BTMES404 Strength of Materials	BTMPE 504A-C BTAPE504A,D Elective-II	BTMPE 604A-D BTAPE 604B (ElectiveIV)	BTMOE704 (Open Elective III)	--
5	BTES105 Energy and Environment Engineering	BTES205 Basic Electrical and Electronics Engineering	BTMCL305 Machine Drawing and CAD Lab	BTMPE405A-D (Elective-I)	BTMOE 505A-D (Open Elective I)	BTMOE605 (Open Elective II)	BTMOE705 (Open Elective IV)	--
6	BTES106 Basic Civil and Mechanical Engineering	BTES206L Workshop Practice	BTMCL306 Mechanical Engineering Lab – I	BTMCL406 Mechanical Engineering Lab-II	BTMC 506 Applied Thermodynamics	BTMCL 606 Mechanical Engineering Lab - IV	BTMCL706 Mechanical Engineering Lab –V	--
7	BTBS107L Engineering Physics Lab	BTBS207L Engineering Chemistry Lab	BTES209P (IT – 1 Evaluation)	BTMI407 (IT – 2)	BTMCL 507 Mechanical Engineering Lab - III	BTMS607 B Tech Seminar	BTMI609 (IT – 3 Evaluation)	--
8	BTES108L Engineering Graphics Lab	BTES208L Engineering Mechanics Lab	Constitution of India	--	BTMI 407 (IT – 2 Evaluation)	BTMP608 Mini Project (TPCS)	----	--
9	BTHM109L Communication Skills Lab	BTES209P (IT - 1)	--	--	Artificial Intelligence	BTMI 609 (IT – 3)	-	--
10	--	--	--	--	--	--	--	--

Degree Requirements: **Total Credits: 160**

Sr. No.	Category	Number of Subjects in Each Category	Suggested Breakup of Credits by AICTE (Total 160)	Total
1	Humanities and Social Sciences including Management courses	4	12	**10**
2	Basic Science courses	7+1*	25	**22+3***
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	11	24	**23**
4	Professional core courses	17	48	**59**
5	Professional Elective courses relevant to chosen specialization/branch	5	18	**16**
6	Open subjects – Electives from other technical and /or emerging subjects	4	18	**12**
7	Project work, seminar and internship in industry or elsewhere	6	15	**18**
8	Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Knowledge Tradition]	2+1*	NC	--
	Total	**56+2**	**160***	**160**

*over and above of 160 credits

Sr.No	Category	Suggested Breakup of Credits (Total 160)	First year		Second year		Third year		Final year		Total
			I	II	III	IV	V	VI	VII	VIII	
1	Humanities and Social Sciences including Management courses	12	03	--	--	03		--	04	--	**10**
2	Basic Science courses	25	09	09	04	3*	--	--	--	--	**22+3***
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	24	06	09	04	04	--	--	--	--	**23**
4	Professional core courses	48	--	--	12	10	19	11	07	--	**59**
5	Professional Elective courses relevant to chosen specialization/branch	18	--	--	--	04	03	06	03	--	**16**
6	Open subjects – Electives from other technical and /or emerging subjects	18	--	--	--	--	03	03	06	--	**12**

7	Project work, seminar and internship in industry or elsewhere	15	--	--	01	--	01	03	01	12	**18**
8	Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Knowledge Tradition]	NC	--	--	--	--	--	--	--	--	--
	Semester wise credits		18	18	21	21 +3 *	26	23	21	12	**160**
	Total	**160**	**37**		**44**		**45**		**34**		

*over and above of 160 credits

Course Structure for Semester VII
B. Tech in Mechanical and Automation Engineering (w. e. f. 2025-26)

Semester VII									
Course Category	**Course Code**	**Course Title**	**Teaching Scheme**			**Evaluation Scheme**				**No. of Credits**
			L	**T**	**P**	**CA**	**MSE**	**ESE**	**Total**	
PCC18	BTMAC701	Robotics and Industrial Automation	3	1	-	20	20	60	100	4
HSSMC4	BTHM702	Industrial Engineering and Management	3		-	20	20	60	100	3
PEC6	BTMAPE703A-C	Elective-V	3	-	-	20	20	60	100	3
OEC3	BTMOE704A-C	Open Elective-III	3	-	-	20	20	60	100	3
OEC4	BTMOE705A-C	Open Elective-IV	3	-	-	20	20	60	100	3
PCC19	BTMACL706	Robotics and Industrial Automation Lab	-	-	2	60	-	40	100	1
PROJ-6	BTMP707	Mini Project 2			6	60		40	100	3
PROJ-7	BTMI609	IT – 3 Evaluation	-	-	-	-	-	100	100	1
Total			**15**	**2**	**06**	**220**	**100**	**480**	**800**	**21**

Elective-V

Sr. No	Course code	Course Name
1	BTMAPE703A	Additive manufacturing
2	BTMAPE703B	Process Control & Automation
3	BTMAPE703C	IOT in Automation.

Open Elective-III

Sr. No	Course code	Course Name
1	BTMOE704A	Sustainable Development (Refer Mechanical)
2	BTMOE704B	Entrepreneurship Development (Refer Mechanical)
3	BTMOE704C	Plant Maintenance (Refer Mechanical)

Open Elective-IV

Sr. No	Course code	Course Name
1	BTMOE705A	Engineering Economics (Refer Mechanical)
2	BTMOE705B	Biology for Engineers (Refer Mechanical)
3	BTMOE705C	Intellectual Property Rights (Refer Mechanical)

Course Structure for Semester VIII
B. Tech in Mechanical and Automation Engineering (w. e. f. 2025-26)

Semester VIII										
Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credit
			L	T	P	CA	MSE	ESE	Total	
PROJ-8	BTMAP801/ BTMAI801	Project Work : Industry based and Internship / Institute level project	-	-	20	60	-	40	100	10
Choose any two subjects from ANNEXURE						20	20	60	100	4
						20	20	60	100	4
Total			**-**	**-**	**20**	**100**	**40**	**160**	**300**	**18**

SEM	I	II	III	IV	V	VI	VII	VIII	TOTAL
CREDITS	18	19	21	20	22	22	21	18	161

Annexure

Sr. NO	Course Code	Course Name	Duration in weeks	Institute Offering Course	Name of Professor
1	BTMAEC801A	Fundamentals of Automotive Systems	12 Weeks	IITM	Prof. C. S. Shankar Ram
2	BTMAEC801B	Introduction to Machine Learning	12 Weeks	IITM	Prof. Balaraman Ravindran
3	BTMAEC801C	Machinery Fault Diagnosis and Signal Processing	12 Weeks	IITKGP	Prof. Amiya Ranjan Mohanty
4	BTMAEC801D	Product Design and Manufacturing	12 Weeks	IITK	Prof. J.Ramkumar Prof. Amandeep Singh
5	BTMAEC801E	Advanced Robotics	12 Weeks	IITK	Prof. Ashish Dutta

Credit Evaluate in SEM -VII

Semester – VII

Robotics and Industrial Automation

BTMAC701	PCC18	Robotics and Industrial Automation	3-1-0	4 Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week Tutorial: 1 hr/week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs)

Pre-Requisites: Basic knowledge of mechanics, electronics, and control systems and Prior coursework in engineering or a related field.

Course Outcomes: At the end of the course, students will be able to:

CO1	To understand the fundamental principles of robotics and automation.
CO2	To learn about various types of robots and their applications in industry.
CO3	To study the design and control aspects of robotic systems.
CO4	To gain insights into the integration of automation in industrial processes.
CO5	To explore the latest advancements and future trends in robotics and industrial automation

Mapping of course outcomes with program outcomes

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3				3						2	2
CO2	3						3		2	2	2	
CO3			3	3				2				
CO4		3				3	3	2				2

Course Contents:

Unit 1: Introduction to Robotics and Industrial Automation [08 Hours]
Definition and history of robotics and automation, Overview of industrial applications, Benefits and challenges of automation, Coordinate systems and transformations, Forward and inverse kinematics

Unit 2: Robot Dynamics [08 Hours]
Newton-Euler and Lagrange methods, Dynamic modeling of robotic manipulators, Simulation of robot dynamics, Types of actuators: electric, pneumatic, hydraulic, Selection criteria for actuators, Sensor technologies: position, velocity, force, and vision sensors.

Unit 3: Robot Control Systems **[08 Hours]**
Open-loop and closed-loop control, PID control and advanced control strategies, Motion planning and trajectory generation, Robot programming languages (e.g., RAPID, KRL, V+).

Unit 4: Industrial Automation Systems **[08 Hours]**
Components of automation systems: PLCs, SCADA, and HMI, Automation system architecture and design, Communication protocols in automation, CNC machines and robotics in manufacturing, Assembly lines and robotic assembly, Automated material handling.

Unit 5: Safety and Standards in Robotics and Automation **[08 Hours]**
Safety standards and regulations, Risk assessment and mitigation, Human-robot collaboration and safety.

Textbooks and References:

- **Primary Textbook**: "Introduction to Robotics: Mechanics and Control" by John J. Craig.
- **Secondary Textbook**: "Automation, Production Systems, and Computer-Integrated Manufacturing" by Mikell P. Groover.
- Additional readings and resources will be provided throughout the course.

Industrial Engineering and Management

BTHM702	HSSMC4	Industrial Engineering and Management	3-1-0	4 Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week Tutorial: 1 hr/week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs)

Pre-Requisites: None

Course Outcomes: At the end of the course, students will be able to:

CO1	Impart fundamental knowledge and skill sets required in the Industrial Management and Engineering profession, which include the ability to apply basic knowledge ofmathematics, probability and statistics, and the domain knowledge of IndustrialManagement and Engineering
CO2	Produce ability to adopt a system approach to design, develop, implement and innovate integrated systems that include people, materials, information, equipment and energy.
CO3	Understand the interactions between engineering, businesses, technological and environmental spheres in the modern society.
CO4	Understand their role as engineers and their impact to society at the national and global context.

Mapping of course outcomes with program outcomes

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1											2	1
CO2									2	2	2	
CO3								2				
CO4								2				2

Course Contents:

Unit 1: Introduction [08 Hours]

Managing and managers, management- science, theory and practice, functions of management,evolution of management theory, contributions of Taylor, Fayol and others.

Planning: The nature and purpose of planning, objectives, strategies, policies and planning premises, decision making.

Organizing: The nature and purpose of organizing, departmentation, Line/ staff authority and decentralization, effective organizing and organizational culture.

Unit 2: Human Resource Management [08 Hours]

Staffing: Human resource management and selection, orientation, apprentice training and Apprentice Act (1961), performance appraisal and career strategy, job evolution and merit rating, incentive schemes.

Leading: Managing and human factor, motivation, leadership, morale, team building, and communication.

Controlling: The system and process of controlling control techniques, overall and preventive control.

Unit 3: Production/Operations Management [08Hours]

Operations management in corporate profitability and competitiveness, types and characteristics of manufacturing systems, types and characteristics of services systems.

Operations planning and Control: Forecasting for operations, materials requirement planning, operations scheduling.

Unit 4: Design of Operational Systems [08Hours]

Product/process design and technological choice, capacity planning, plant location, facilities layout, assembly line balancing, and perspectives on operations systems of the future.

Unit 5: Introduction to Industrial Engineering and Ergonomics [08 Hours]

Scope and functions, history, contributions of Taylor, Gibreth, Gantt and others.

Work Study and Method Study: Charting techniques, workplace design, motion economy principles.

Work Measurement: Stopwatch time study, micromotion study, predetermined time system (PTS), work sampling.

Ergonomics Basic principles of ergonomics

Concurrent Engineering: Producibility, manufacturability, productivity improvement.

Total Quality Management: Just in time (JIT), total quality control, quality circles, six sigma.

Texts:

1. H. Koontz, H. Weirich, “Essentials of Management”, Tata McGraw Hill book Co., Singapore, International Edition, 5th edition, 1990.
2. E. S. Buffa, R. K. Sarin, “Modern Production/Operations Management”, John Wiley and Sons, New York, International Edition, 8th edition, 1987.
3. P. E. Hicks, “Industrial Engineering and Management: A New Perspective”, Tata McGraw Hill Book Co., Singapore, International Edition, 2nd edition, 1994.

References:

1. J. L. Riggs, “Production Systems: Planning, Analysis and Control”, John Wiley & Sons,

New York, International Edition, 4th edition, 1987.
2. H. T. Amrine, J. A. Ritchey, C. L. Moodie, J. F. Kmec, "Manufacturing Organization and Management", Pearson Education, 6th edition, 2004.
International Labour Organization (ILO), "Introduction to Work Study", International Labour Office, Geneva, 3rd edition, 1987.

Elective-V

Additive Manufacturing

BTMAPE703A	PEC6	Additive Manufacturing	3-0-0	3 Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs)

Pre-Requisites: None

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand the importance of Additive Manufacturing
CO2	Classify the different AM processes
CO3	Design for AM processes
CO4	Understand the applications of AM
CO5	Differentiate the post processing processes

Mapping of course outcomes with program outcomes

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	2	2					1
CO2	2	2	3	3	3	3	1					1
CO3	2	2	3	3	3		2					1
CO4	3	3	3	2	2	2	2					1
CO5	2	3	3	2	2	2	2					1

Course Contents:

Unit 1: Introduction to Additive Manufacturing (AM) [08Hours]

Introduction to AM, AM evolution, Distinction between AM and CNC machining, Advantages of AM.

AM process chain: Conceptualization, CAD, conversion to STL, Transfer to AM, STL file manipulation, Machine setup, build , removal and clean up, post processing.

Classification of AM processes: Liquid polymer system, discrete particle system, molten material systems, and solid sheet system.

Unit 2: Design for AM [08 Hours]

Motivation, DFMA concepts and objectives, AM unique capabilities, Exploring design freedoms, Design tools for AM, Part Orientation, Removal of Supports, Hollowing out parts, Inclusion of Undercuts and Other Manufacturing Constraining Features, Interlocking Features, Reduction of Part Count in an Assembly, Identification of markings/ numbers etc.

Unit 3: Guidelines for Process Selection [08Hours]

Introduction, selection methods for a part, challenges of selection, example system for preliminary selection, production planning and control

Unit 4: AM Applications [08 Hours]

Functional models, Pattern for investment and vacuum casting, Medical models, art models, Engineering analysis models, Rapid tooling, new materials development, Bi-metallic parts, Re-manufacturing. Application examples for Aerospace, defense, automobile, Bio-medical and general engineering industries

Unit 5: Post Processing of AM Parts and Future Directions of AM [08Hours]

Support material removal, surface texture improvement, accuracy improvement, aesthetic improvement, preparation for use as a pattern, property enhancements using non-thermal and thermal techniques.

Future Directions of AM Introduction, new types of products, employment and digiproneurship.

Texts:

1. Chua Chee Kai, Leong Kah Fai, "Rapid Prototyping: Principles and Applications", World Scientific, 2003.
2. Ian Gibson, David W. Rosen, Brent Stucker, "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2nd edition, 2010.

References:

1. Ali K. Kamrani, EmandAbouel Nasr, "Rapid Prototyping: Theory and Practice", Springer, 2006.
2. D. T. Pham, S. S. Dimov, "Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling", Springer, 2001.
3. Andreas Gebhardt, "Understanding Additive Manufacturing", Hanser Publishers, 2011.

Process Control and Automation

BTMAPE703B	PEC6	Process Control and Automation	3-0-0	3 Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs)

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand process control hierarchies, derive theoretical models using transfer functions and state space, and develop time series models.
CO2	Understand the Feedback &Feed forward Control system in process Control
CO3	Understand Analyze and design multi-loop and multivariable control systems, mitigate process interactions using singular value analysis and tuning,
CO4	Discuss batch process control, plant-wide control design, instrumentation for process monitoring, and implement statistical process control.
CO5	Explain OPC, discuss environmental issues and sustainable development, and compare the performance of different types of control systems with examples.

Mapping of course outcomes with program outcomes

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3									2
CO2	2	3	3									1
CO3	1	2	3									2
CO4	2	1	3									2
CO5	2	3	1									1

Course Contents:

Unit I- Process Modelling **[08 Hours]**

Introduction to Process control and process instrumentation-Hierarchies in process control systems-Theoretical models-Transfer function-State space models-Time series models.

Unit-II Feedback &Feed forward Control **[08 Hours]**

Feedback controllers-PID design, tuning, trouble shooting-Cascade control- Selective control loops-Ratio control-Control system design based on Frequency response Analysis-Direct digital design-Feed forward and ratio control-State feedback control- LQR problem

Unit –III Advanced process control **[08 Hours]**

Multi-loop and multivariable control-Process Interactions-Singular value analysis-tuning of multi loop PID control systems-decoupling control-strategies for reducing control loop interactions -Real-time optimization.

Unit- IV Model predictive control **[08 Hours]**

Batch Process control-Plant-wide control & monitoring- Plant wide control design- Instrumentation for process monitoring-Statistical process control-

Unit- V Introduction to Fuzzy Logic in Process Control **[08 Hours]**

Introduction to OPC-Introduction to environmental issues and sustainable development relating to process industries. Comparison of performance different types of control with examples.

Text Books:

1. Seborg, D.E., T.F. Edgar, and D.A. Mellichamp, Process Dynamics and Control, John Wiley, 2004
2. Johnson D Curtis, Instrumentation Technology, (7th Edition) Prentice Hall India, 2002.
3. Bob Connel, Process Instrumentation Applications Manual, McGraw Hill, 1996.

References Books:

4. Edgar, T.F. & D.M. Himmelblau, Optimization of Chemical Processes, McGraw Hill Book Co, 1988.
5. Macari Emir Joe and Michael F Saunders, Environmental Quality Innovative Technologies
6. Patrick Bouwman,Fundamentals of Process Control: Principles and Concepts, International Society of Automation (12 July 2022)

IOT in Automation

BTMAPE703C	PEC6	IOT in Automation	3-0-0	3 Credits

Teaching Scheme:	**Examination Scheme:**

Lecture: 3 hrs/week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs)

Course Outcomes: At the end of the course, students will be able to:

CO1	Discover key IIoT concepts including identification, sensors, localization, wireless protocols, data storage and security
CO2	Explore IoT technologies, architectures, standards, and regulation
CO3	Realize the value created by collecting, communicating, coordinating, and leveraging the data from connected devices
CO4	Examine technological developments that will likely shape the industrial landscape in the future
CO5	Understand how to develop and implement own IoT technologies, solutions, and applications

Mapping of course outcomes with program outcomes

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3		3							1
CO2	1	1	2		3							1
CO3	3	2	1		3							2
CO4	3	2	2		2							2
CO5	2	3	3		2							1

Course Contents:

UNIT - I: Introduction & Architecture: What is IIoT and the connected world? the difference between IoT and IIoT, Architecture of IIoT, IOT node, Challenges of IIOT. Fundamentals of Control System, introductions, components, closed loop & open loop system. **[08 Hours]**

UNIT - II: IIOT Components: Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, working principle of basic Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11). Digital switch, Electro Mechanical switches. **[08 Hours]**

UNIT - III: Communication Technologies of IIoT: Communication Protocols: IEEE 802.15.4, ZigBee, Z Wave, Bluetooth, BLE, NFC, RFID Industry standards communication technology (LoRAWAN, OPC UA, MQTT), connecting into existing Modbus and Profibus technology, wireless network communication. **[08 Hours]**

UNIT - IV: Visualization and Data Types of IIoT: Front-end EDGE devices, Enterprise data for IoT, Emerging descriptive data standards for IIoT, Cloud database, Cloud computing, Fog or Edge computing. Connecting an Arduino/Raspberry pi to the Web: Introduction, setting up the Arduino/Raspberry pi development environment, Options for Internet connectivity with Arduino, Configuring your Arduino/Raspberry pi board for the IoT. **[08 Hours]**

UNIT - V: Retrieving Data: Extraction from Web: Grabbing the content from a web page, Sending data on the web, Troubleshooting basic Arduino issues, Types of IoT interaction, Machine to

Machine interaction (M2M). Control & Supervisory Level of Automation: Programmable logic controller (PLC), Real-time control system, Supervisory Control & Data Acquisition (SCADA). HMI in an automation process, ERP & MES. **[08 Hours]**

TEXT BOOKS:

1. The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication)
2. Industrial Internet of Things: Cyber manufacturing System, Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication)
3. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)

REFERENCE BOOK:

1. IoT Automation: Arrowhead Framework, CRC Press.

Robotics and Industrial Automation Lab

BTMCL706	PCC19	Robotics and Industrial Automation	0-0-2	1 Credit

Practical Scheme:	**Examination Scheme:**
Practical: 6 hrs/batch	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks

List of Practical's/Experiments/Assignments (Any Six)

1. Introduction to Robot Kinematics and Dynamics
2. Safety Protocols in Robotics Lab
3. Basics of Robot Programming Languages (e.g., RAPID, KRL)
4. Writing and Executing Simple Robot Programs
5. To study Force and Torque Sensing in Robotics
6. To study Introduction to HMI Design
7. To study Introduction to PLC Hardware and Software

Mini-project 2

BTMAP 708	PROJ 7	Mini-project 2	0-0-6	3 Credit

Practical Scheme:	**Examination Scheme:**
Practical: 6 hrs/batch	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks

- BTMAP708 Mini Project and BTMAP801/ BTMAI801 Project /Internship are independent and allotment will also be done independently in respective semester.
- BTMAP708 Mini Project will be done in-house only.
- Evaluation of both will be done independently as per the time schedule in AC.
- In case student(s) choose in-house project, it may be an extension of the Mini Project, however, Mini Project should be completed in all respect in semester VII itself.

SEMESTER VIII
Porject- 7

BTMP801/ BTMI801	Project work/ Internship	PROJ-7	0L-0T-24P	12 Credits

Teaching Scheme:	**Examination Scheme:**
Practical: 24 hrs/week	Continuous Assessment: 60 Marks Mid Semester Exam: -- End Semester Exam: 40 Marks

ANNEXURE

Sr. NO	Course Code	Course Name	Duration in weeks	Institute Offering Course	Name of Professor

1	BTMEC801A	Fundamentals of Automotive Systems	12 Weeks	IITM	Prof. C. S. Shankar Ram
2	BTMEC801B	Introduction to Machine Learning	12 Weeks	IITM	Prof. Balaraman Ravindran
3	BTMEC801C	Machinery Fault Diagnosis and Signal Processing	12 Weeks	IITKGP	Prof. Amiya Ranjan Mohanty
4	BTMEC801D	Product Design and Manufacturing	12 Weeks	IITK	Prof. J.Ramkumar Prof. Amandeep Singh
5	BTMEC801E	Advanced Robotics	12 Weeks	IITK	Prof. Ashish Dutta

SEM	I	II	III	IV	V	VI	VII	VIII	TOTAL
CREDITS	18	19	21	20	22	22	21	18	161

Dr. Babasaheb Ambedkar Technological University, Lonere

Sr. No.	NAME OF SUBJECT AS PER CURRICULUM COURSE	COURSE CODE	SEMESTER	SWAYAM / NPTEL Course	Name of Institute offering course	Relevance %	DURATION OF COURSE
1	Engineering Mathematics-III	BTBS30	III	Engineering Mathematics-I	IITKGP	40	12 Weeks
2	Fluid Mechanics	BTMC302		Fluid Mechanics	IITKGP	70	8 Weeks
				Fluid dynamics and Turbomachines	IITM	40	8 Weeks
3	Thermodynamics	BTMC303		Concepts Of thermodynamics	IITKGP	90	12 Weeks
				Concepts of Thermodynamics	IITKGP		
				Engineering Thermodynamics	IITK		
4	Material Science and Metrallurgy	BTMES304		Material Science and Engineering	IITR	70	8 Weeks
				Introduction to Material Science and Engineering	IITD	70	12 Weeks
				Corrosion – Part- I	IITK	70	8 Weeks
5	Manufacturing Process- I	BTMC40	IV	Manufacturing Process - I	IITR	60	12
				Fundamental of Manufacturing Process	IITR	60	12
6	Theory of Machine-I	BTMC402		Theory of Machines	IITK	70	Module
				Kinematics of Machines	IITM	70	Module
7	Basics Human and Rights	BTHM403		Human Rights in India	O.P. Jindal Global University	60	15 Weeks
				Exploring Human Values: Visions of Happiness and Perfect Society - Web course	IITK	40	Module
8	Strength of Materials	BTMES404		Strength of Materials	IITKGP	80	12 Weeks
9	Applied Thermodynamics	BTMPE405A		Concepts of Thermodynamics	IIT KGP	70	12 weeks
				Applied Thermodynamics	IIT Madras		Module
10	Numerical Method in Engineering	BTMPE405B		Numerical Methods for Engineers	IIT Madras	80	12 weeks
				Numerical methods	IITR	80	4 Weeks
11	Sheet Metal Engineering	BTMPE405C		Metal Forming	IITR	70	Module
12	Fluid Machinery	BTMPE405D		Fluid Machanics	IITKGP	70	8 Weeks
				Fluid dynamics and turbomachines	IITM	60	8 Weeks
13	Heat Transfer	BTMC501	V	Heat and Mass Trasnfer	IITM	70	Module
14	Machine Design – I	BTMC502		Design of Machine Elements I	IITGP	70	12 Weeks
15	Theory of Machine - II	BTMC503		Design of Machine Elements I -	IITKGP	30	Module
				Dynamics of Machines	IITK	30	Module
16	Metrology and Quality Control	BTMPE504A		Engineering Metrology	IITJ	60	12 Weeks
17	Refrigeration and air-conditioning	BTMPE504B		Refrigeration and air-conditioning	IITR	70	8 Weeks
				Refrigeration and air-conditioning	IIT KGP	70	Module
18	Steam and Gas Turbine	BTMPE504C		Steam Power Engineering	IITG	30	8 Weeks
				IC Engines and Gas Turbines	IITG	50	12 Weeks
19	Engineering Tribology	BTMPE504D		Tribology	IITD	70	Module
20	Automobile Design	BTAPE504A		Fundamentals of manufacturing Process	IITR	20	12 Weeks
				Basics Of Finite Element Analysis – I	IITK		8 Weeks

21	Automobile Engineering	BTAPE504D		Fundamentals of Automotive Systems	IITM	40	12 Weeks
22	Solar Engineering	BTMOE505A		Solar Engineering Technology -	IITKGP	40	Module
23	Renewable Energy Sources	BTMOE505B		Technologies For Clean And Renewable Energy Production	IITR	30	8 Weeks
24	Human Resource Management	BTMOE505C		Human resource development	IIT KGP	40	12 Weeks
25	Product Design Engineering	BTMOE505D		Product Design Using Value Engineering	IITR	30	4 weeks
				Product Design and Innovation	IITG	30	4 Weeks
				Product Design and Manufacturing	IITK	30	8 Weeks
				Product Design and Development	IITR	30	4 Weeks
26	Manfacturing Process - II	BTMC601		Manufacturing Process - II	IITKGP	30	Module
				Manufacturing Process - II	IITKGP	30	Module
27	Machine Design- II	BTMC602		Machine Design II	IIT Madras	80	Module
28	IC Engines	BTMPE603A		IC Engines and Gas Turbines	IITG	40	12 weeks
29	Mechanical Vibration	BTMPE603B		Introduction to Mechanical Vibration	IITR	70	8 Weeks
			VI	Principles Of Vibration Control	IITK	40	4 Weeks
30	Machine Tool Design	BTMPE603C		Metal Cutting And Machine Tools	IITKGP	60	4 weeks
				Computer Numerical Control Of Machine Tools And Processes	IITGP	60	4 Weeks
31	Automobile Body Design	BTAPE603D		Advances in welding and joining technologies	IIT Guwahati	30	8 Weeks
				Welding Processes	IITM	30	12 Weeks
32	E-Vehicle	BTAPE603E		Introduction to Hybrid and Electric Vehicles -	IITG	30	Module
33	Process Equipement Design	BTMPE604A		Equipment Design: Mechanical Aspects	IITR	60	4 weeks
34	Product Life Cycle Management	BTMPE604B		Product Designand Services	IITR	30	4 Weeks
				Management of New Products and Services	IITK	30	4 Weeks
35	Finite Element Method	BTMPE604C		Basics Of Finite Element Analysis – I	IIT Kanpur	55	8 Weeks
				Finite Element Method-Variational Method to Computer Programming	IIT Guwahati		12 Weeks
36	Robotics	BTMPE604D		Introduction to Robotics	IIT Madras	60	12 Weeks
				Mechanism and Robot Kinametics	IIT Kharagpur		8 Weeks
				Robotics	IIT Kharagpur		8 Weeks
37	Computational Fluid Dynamics	BTAPE604B		Computational Fluid Dynamics for Incompressible Flows	IITG	60	12 Weeks
38	Quatitative Techniques and Project Management	BTMOE605A		Introduction to Operation Research	IITR	60	8 Weeks
				Operation Management	IITM	40	12 Weeks
39	Nanotechnology	BTMOE605B	VI	Introduction to Mechanical Micro Maching	IITKGP	50	12 Weeks
40	Eneregy Conversation and Mangement	BTMOE605C		Energy Conservation And Waste Heat Recovery	IITKGP	50	12 Weeks

41	Wind Energy	BTMOE605D		Non Convectional Energy Resources	IITM	40	12 Weeks
				Non-Conventional Energy Resources	IITM	40	12 Weeks
42	Introduction to Probability Theory and Statics	BTMOE605E		Introduction To Probability And Statistics	IITM	50	04 weeks
43	Mechatronics	BTMC701	VII	Mechatronics And Manufacturing Automation	IITG	60	12 Weeks
44	Industrial Engineering and Management	BTHM702		Project Management for Managers	IITR	50	12 Weeks
				Principles of Industrial Engineering	IITR	50	12 Weeks
45	Design of Air Conditioning Systems	BTMPE703A		Refrigeration and Air Conditioning (Video Course)	Prof. Ravi Kumar	80	8 Weeks
				Refrigeration and Air Conditioning	IITKGP	90	12 Weeks
				RAC Product Design	IITD	80	8 Weeks
46	Biomechanics	BTMPE703B		Mechanics of Human Movement	IIT Madras	20	12 Weeks
47	Non-conventional Machining	BTMPE703C		Advanced Machining Processes	IIT Guwahati	50	8 Weeks
48	Advanced IC Engines	BTMPE703D		IC Engines and Gas Turbines	IIT Guwahati	40	12 Weeks
49	Additive Manufacturing	BTMPE703E		The Future of Manufacturing Business: Role of Additive Manufacturing	IIT Madras	10	8 Weeks
50	Surface Engineering	BTMPE703F		Fundamentals of Surface Engineering: Mechanisms, Processes and Characterizations	IIT Roorkee	20	12 Weeks
51	Processing of Polymers	BTMPE703G		Processing of Polymers and Polymer Composites	IIT Roorkee	70	8 Weeks
52	Entrepreneurship Development	BTMOE704B		Entrepreneurship Essentials	IIT Khargpur	70	12 Weeks
				Entrepreneurship	IIT Madras	50	12 Weeks
				Entrepreneurship Development	B.K. School of Business Management, Gujarat University	60	12 Weeks
				NOC-Entrepreneurship	IIT Madras	40	12 Weeks
53	Plant Maintenance	BTMOE704C	VII	Machinery fault diagnosis and signal Processing	IIT Kharagpur	15	12 Weeks
				Project Management	IIT Kanpur	10	8 Weeks
54	Engineering Economics	BTMOE705A		Engineering economics analysis	IIT Roorkee	60	8 Weeks
55	Biology for Engineers	BTMOE705B		NOC: Biology for engineers and other non-biologists	IIT Madras	90	4 Weeks
56	Intellectual Property Rights	BTMOE705C		Intellectual Property Rights	IIT Madras	70	11 Weeks
				NOC: Introduction on Intellectual Property to Engineers and Technologists	IIT Khakarpur	60	8 Weeks
Course Mapping with COURSERA Online Platform							

1	Engineering Mathematics-III	BTBS30	III	Introduction to Ordinary Differential Equations	Korea Advanced Institute of Science and Technology	20	9 Weeks
2	Fluid Mechanics	BTMC302		Fundamentals of Fluid Power	University of Minnesota	40	6 Weeks
				Fluid Properties	Georgia Institute of Technology	30	8 Weeks
3	Thermodynamics	BTMC303		Introduction to Thermodynamics: Transferring Energy from Here to There	Universiy of Michigan	30	8 Weeks
				Statistical Thermodynamics Specialization	University of ColorodoBoulder	30	5 Weeks
4	Material Science and Metrallurgy	BTMES304		Materials Science: 10 Things Every Engineer Should Know	University of California, Davis	20	5 Weeks
				Material Behavior	Georgia Institute of Technology	20	5 Weeks
5	Manufacturing Process- I	BTMC40		Manufacturing Processes Management	University at Buffalo	20	4 Weeks

6	Theory of Machine-I	BTMC402	IV	Engineering Systems in Motion	Dr. Wayne Whiteman	50	7 Weeks
7	Basics Human and Rights	BTHM403		Human Rights for Open Societies	Utrecht University	50	6 Weeks
8	Strength of Materials	BTMES404		Mechanics of Materials - I	Prof. Wayne Whiteman	40	3 Weeks
				Mechanics of Materials - II		40	5 Weeks
				Mechanics of Materials - III		40	4 Weeks
9	Applied Thermodynamics	BTMPE405A		Introduction to Thermodynamics	Prof. Margaret Wooldridge	40	8 Weeks
10	Numerical Method in Engineering	BTMPE405B		Introduction to Numerical Methods	Prof. Evgeni Burovski	60	7 Weeks
				Introduction to numerical analysis	National Research University Higher School of Economics	50	6 Weeks
11	Sheet Metal Engineering	BTMPE405C	IV	Creating Sheet Metal Parts	Autodesk	10	4 Weeks
12	Fluid Machinery	BTMPE405D		Fluid Properties	Georgia Institute of Technology	20	8 Weeks
13	Machine Design – I	BTMC502	V	Machine Design Part I	Dr. Kathryn Wingate	20	5 Weeks
14	Theory of Machine - II	BTMC503		Engineering Systems in Motion: Dynamics of Particles and Bodies in 2D Motion	Georgia Institute of Technology	20	7 Weeks
15	Metrology and Quality Control	BTMPE504A		Intellgent Machining	University at Buffalo	20	4 Weeks
16	Refrigeration and air-conditioning	BTMPE504B		Introduction to Thermodynamics: Transferring Energy from Here to There	Margaret Wooldridge	30	8 Weeks
17	Steam and Gas Turbine	BTMPE504C		Introduction to Thermodynamics: Transferring Energy from Here to There	University of Michigan	20	8 weeks
18	Solar Engineering	BTMOE505A		Solar Energy . Basic	Prof. Neal Abrams	20	5 Weeks
19	Renewable Energy Sources	BTMOE505B		Exploring Renewable Energy Schemes	Prof. Jorge Santiago-Aviles	40	6 Weeks
				Solar Energy Basic	Prof. Neal Abrams	20	5 Weeks

20	Human Resource Management	BTMOE505C		Human Resource Management: HR for People Managers Specialization	University of Minnesota	40	5 weeks
21	Product Design Engineering	BTMOE505D		New Product Development - develop your own new product	Avy Shtub Technion - Israel Institute of Technology	30	12 weeks
22	IC Engines	BTMPE603A		The Hardware of Our Internal Combustion Engines	Margaret Wooldridge University of Michigan	15	8 Weeks
23	Mechanical Vibration	BTMPE603B		Introduction to Basic Vibration	Prof. Yang-HannKim	25	5 Weeks
24	E-Vehicle	BTAPE603E	VI	Electric Vehicles and Mobility	École des PontsParisTech	5	6 Weeks
25	Product Life Cycle Management	BTMPE604B		New Product Development – develop your own new product	Technion – Israel Institute of Technology	30	10 Weeks
26	Finite Element MEthod	BTMPE604C		The Finite Element Method for Problems in Physics	Universiy of Michigan	40	13 Weeks
27	Robotics	BTMPE604D		Robotics Specialization	University of Pennsylvania	40	6 Weeks
28	Computational Fluid Dynamics	BTAPE604B		Simulation and modeling of natural processes	University of Geneva	40	6 weeks
29	Quatitative Techniques and Project Management	BTMOE605A	VI	`Shortest Paths Revisited, N P-Complete Problems and What To Do About Them	Prof. Tim Roughgarden	20	4 Weeks
				Supply Chain Analytics Essentials	Yao Zhao	20	4 Weeks
30	Nanotechnology	BTMOE605B		Nanotechnology: A Maker's Course	Duke University	50	6 Weeks
				Nanotechnology and Nanosensors	Technion - Israel Institute of Technology	60	8 Weeks
31	Wind Energy	BTMOE605D		Wind Energy	Prof. Merete Badger	30	5 Weeks
32	Introduction to Probability Theory and Statics	BTMOE605E		Introduction to Probability and Data	Duke University	10	12 Hr
33	Mechatronics	BTMC701	VII	Embedding Sensors and Motors Specialization	University of Colorado Boulder	40	5 Months
34	Additive Manufacturing	BTMPE703E		Generative Design for Additive Manufacturing	Autodesk	5	4 Weeks
35	Surface Engineering	BTMPE703F		Methods of Surface Analysis	National Research Nuclear University, Russia	5	5 Weeks
36	Sustainable Development	BTMOE704A		The Age of Sustainable Development	Columbia University	85	4 Weeks
37	Entrepreneurship Development	BTMOE704B		Entrepreneurship 1: Developing the Opportunity	Wharton University of Pennsylyania	30	4 Weeks
				Entrepreneurship	The Chinese University of Hong Kong	40	4 Weeks

				Essentials of Entrepreneurship: Thinking & Action	University of California, Irvine	40	4 Weeks
38	Intellectual Property Rights	BTMOE705C		Introduction to Intellectual Property	R. Polk Wagner University of Pennsylvania	40	4 Weeks
				Intellectual Property Law Specialization	R. Polk Wagner University of Pennsylvania	30	4 Weeks
Course Mapping with EDx Online Platform							
1	Engineering Mathematics-III	BTBS30	III	Transfer Functions and the Laplace Transform	Massachusetts Institute of Technology	30	10 Weeks
2	Fluid Mechanics	BTMC302		AP® Physics 2 - Part 1: Fluids and Thermodynamics	Rice	20	5 Weeks
3	Material Science and Metrallurgy	BTMES304		Structure of Materials	MITX	10	16 Weeks
4	Manufacturing Process- I	BTMC401	IV	Fundamental of Manufacturing Process	MITx	20	10 Weeks
5	Theory of Machine-I	BTMC402	IV	Mechanics: Kinematics and Dynamics	Prof. DeeptoChakrabarty	40	12 Weeks
6	Basics Human and Rights	BTHM403		Human Rights Defenders	Amnesty International	40	4 Weeks
7	Strength of Materials	BTMES404		Mechanical Behaviour of Materials	Prof. Loma J Gibson	40	4 Weeks
8	Applied Thermodynamics	BTMPE405A		Thermodynamics	IIT Bombay	30	12 Weeks
9	Sheet Metal Engineering	BTMPE405C		Fundamental of Manufacturing Process	MITx Massachusetts Institute of Technology	30	
10	Heat Transfer	BTMC501	V	Advanced Transport Phenomena	Delft University of Technology	20	6 Weeks
11	Refrigeration and air-conditioning	BTMPE504B		Thermodynamics	IIT Bombay	20	12 Weeks
12	Steam and Gas Turbine	BTMPE504C		Energy Supply Systems	Delft University of Technology	40	4 weeks
13	Engineering Tribology	BTMPE504D		Tribology	Masschusetts Institute of Technology	50	6 Weeks
14	Automobile Engineering	BTAPE504D		Automotive Engine Fundamentals	Tsinghua University	5	14 Weeks
15	Solar Engineering	BTMOE505A		Solar Energy	Delftx	20	8 Weeks
16	Renewable Energy Sources	BTMOE505B		Incorporating Renewable Energy in Electricity Grids	Imperial College , London	40	6 Weeks
17	Human Resource Management	BTMOE505C		People Management	IIMBx	20	6 Weeks
18	Product Design Engineering	BTMOE505D		Product Design: The Delft Design Approach	DelftX	20	7 Weeks
19	Manfacturing Process - II	BTMC601		Fundamentals of Manufacturing Processes	MITx	20	10 Weeks

20	IC Engines	BTMPE603A		Hybrid Vehicles	ChalmersX	10	6 Weeks
21	Mechanical Vibration	BTMPE603B		Mechanical Vibration	Open Edx	10	8 Weeks
22	Product Life Cycle Management	BTMPE604B		Lead the product life cycle from discovery to delivery	University of Maryland, College Park	10	20 Weeks
			VI	Project Management Life Cycle	Rochester Institute of Technology	10	10 Weeks
23	Finite Element Method	BTMPE604C		Finite Element Method (FEM) Analysis and Application	Tsinghua University	30	20 Weeks
24	Robotics	BTMPE604D		Robotics	Columbia University	60	7 Weeks
25	Computational Fluid Dynamics	BTAPE604B		A Hands-on Introduction to Engineering Simulations	Cornell University	40	6 Weeks
26	Quatitative Techniques and Project Management	BTMOE605A	VI	Operations Research: an Active Learning Approach	The Hongong Polytechnic University	30	6 Weeks
				The Basics of Transport Phenomena	Prof. Robert Mudde	20	7 Weeks
27	Nanotechnology	BTMOE605B		Nanotechnology: Fundamentals of Nanotransistors	Purdue University	20	4 Weeks
				Nanoscience and Technology	Purdue University	20	8 Weeks
28	Introduction to Probability Theory and Statics	BTMOE605E		Probability - The Science of Uncertainty and Data	Massachusetts Institute of Technology	40	10Week
29	Mechatronics	BTMC701	VII	Mechatronics Revolution: Fundamentals and Core Concepts	Guggenheim School of Aerospace Engineering	80	8 Weeks
30	Design of Air Conditioning Systems	BTMPE703A		Efficient HVAC Systems	Delft university of technology	60	5 Weeks
				Thermal Comfort in Buildings	Delft University of technology	50	5 Weeks
31	Surface Engineering	BTMPE703F		Surface Science: Methods of Surface Analysis	MEPhIx	10	8 Weeks
32	Sustainable Development	BTMOE704A		Age of Sustainable Development	SDG Academy	80	14 Weeks
33	Entrepreneurship Development	BTMOE704B		Entrepreneurship for Engineers	Delft university of Technology	30	8 Weeks
				Becoming an Entrepreneur	Massachusetts institute of Technology	40	6 weeks
				DO Your Venture: Entrepreneurship For Everyone	IIM Bangalore	50	6 weeks
				Marketing Management	IIM Bangalore	20	9 weeks