

CURRICULUM  
&  
SYLLABUS  
2022  
(Autonomous)

M Tech  
Power Control and Drives

**MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY**

**Mar Ivanios Vidyanagar, Nalanchira, Thiruvananthapuram – 695 015**

April 2022

**CURRICULUM AND DETAILED SYLLABI**  
**FOR**  
**M.TECH DEGREE PROGRAMME**  
**IN**  
**ELECTRICAL AND ELECTRONICS ENGINEERING**

**POWER CONTROL AND DRIVES**

SEMESTERS I TO IV

**2022 SCHEME**  
**(AUTONOMOUS)**



**MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY**

(Approved by AICTE, Autonomous Institution Affiliated to APJ Abdul Kalam Technological University)  
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**MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**Vision and Mission of the Institution**

**Vision:**

To be an Institution moulding globally competent professionals as epitomes of Noble Values.

**Mission:**

To transform the Youth as technically competent, ethically sound and socially committed professionals, by providing a vibrant learning ambience for the welfare of humanity.

**Vision and Mission of the Department**

**Vision:**

To be a Centre of Excellence in Electrical and Electronics Engineering Education, Research and Application of knowledge to benefit the society at large.

**Mission:**

To mould quality Electrical Engineers, fostering creativity and innovation to address global issues.

# **PART A**

**M TECH IN POWER CONTROL AND DRIVES****CURRICULUM UNDER AUTONOMY STATUS****Medium of Instruction: English****i) Knowledge Segments and Credits**

Every course of M. Tech Programme is placed in one of the seven categories as listed in table below. No semester shall have more than six lecture-based courses and two laboratory courses, and/or drawing/seminar/project courses in the curriculum.

Sl. No.	Category	Category Code	Number of Courses	Total Credits
1	Discipline Core Courses	DCC	2	6
2	Programme Core Courses	PCC	3	9
3	Programme Elective Courses	PEC	4	12
	MOOC		1	2
4	Industry/Interdisciplinary Elective	IEC	1	3
5	Mandatory Credit Course (Research Methodology)	RM	1	2
6	Laboratory Courses	LBC	2	2
7	Mini Project	PR	1	2
8	Project		2	27
9	Internship		1	3
Total Mandatory Credits				68

**Programme Core:** Modelling of Electrical Machines, Power Converter Circuits, Design Principles of Power Converters.

**Discipline Core:** Linear Algebra and Optimization Techniques, Electric Drives.

**Lab Courses:** Power Electronics Lab, Drives and Simulation Lab.

**ii) Semester-wise Credit Distribution**

<i>Semester</i>	<i>I</i>	<i>II</i>	<i>III</i>	<i>IV</i>	<i>Total Credits</i>
<i>Credits for Courses</i>	<i>18</i>	<i>18</i>	<i>16</i>	<i>16</i>	<i>68</i>

**iii) Weightage of the CIA and ESE for various categories of the courses**

Sl. No.	Category	CIA weightage	ESE weightage	Pass minimum
1	Discipline Core Courses	40%	60%	45% for ESE and 50% for (CIA & ESE) put together
2	Programme Core Courses	40%	60%	45% for ESE and 50% for (CIA & ESE) put together
3	Programme Elective Courses	40%	60%	45% for ESE and 50% for (CIA & ESE) put together
4	Lab Courses/ Mini Project	100%	---	50% for CIA
5	MOOC	---	---	As stipulated by the agency conducting MOOC
6	Research Methodology & IPR	40%	60%	45% for ESE and 50% for (CIA & ESE) put together
7	Internship	50%	50%	45% for ESE and 50% for (CIA & ESE) put together
8	Dissertation/ Research Project Phase I	100%	---	50% for CIA
9	Dissertation/ Research Project Phase II	50%	50%	45% for ESE and 50% for (CIA & ESE) put together

**iv) PATTERN OF ASSESSMENT****1. CORE COURSES****a) Continuous Internal Assessment: 40 Marks**

Micro project/ Course based project: The project shall be done individually. Group projects not permitted.	<b>20 Marks</b>
Course based task/ Seminar/ Quiz:	<b>10 Marks</b>
One Continuous assessment Test (CAT): (CAT shall include minimum 80% of the syllabus)	<b>10 Marks</b>
<b>Total</b>	<b>40 marks</b>

### Pattern of Continuous Assessment Test

- The maximum marks for Continuous assessment test is 50 and duration is 2 hours.
- The question paper will have two parts: Part A and Part B.

**Part A** contain 4 questions (such questions shall be useful in the testing of knowledge, skills, comprehension, application, analysis, synthesis, evaluation and understanding of the students), with 1 question from each module, having 5 marks for each question. Students shall answer all questions.

**Part B** contains 6 questions (such questions shall be useful in the testing of overall achievement and maturity of the students in a course, through long answer questions relating to theoretical/practical knowledge, derivations, problem solving and quantitative evaluation), with minimum one question from each module of which student shall answer any five. Each question can carry 6 marks. Total duration of the examination will be 120 minutes.

### b) Pattern of End Semester Examination

- The maximum marks for End semester examination is 60 and duration is 2½ hours.
- The question paper will have two parts: Part A and Part B.

**Part A** contain 5 questions (such questions shall be useful in the testing of knowledge, skills, comprehension, application, analysis, synthesis, evaluation and understanding of the students), with 1 question from each module, having 5 marks for each question. Students shall answer all questions.

**Part B** contains 7 questions (such questions shall be useful in the testing of overall achievement and maturity of the students in a course, through long answer questions relating to theoretical/practical knowledge, derivations, problem solving and quantitative evaluation), with minimum one question from each module of which student shall answer any five. Each question can carry 7 marks. Total duration of the examination will be 150 minutes.

## 2. ELECTIVE COURSES

### a) Continuous Internal Assessment : 40 Marks

Preparing a review article based on peer reviewed Original publications (minimum 10 publications shall be referred) :	<b>15 Marks</b>
Course based task/ Seminar/ Data collection and interpretation:	<b>15 Marks</b>
One Continuous assessment Test (CAT): CAT shall include the first four modules of the syllabus	<b>10 Marks</b>
<b>Total</b>	<b>40 Marks</b>

### Pattern of Continuous Assessment Test

- The maximum marks for Continuous assessment test is 50 and duration is 2 hours.

- The question paper will have two parts: Part A and Part B.

**Part A** contain 4 questions (such questions shall be useful in the testing of knowledge, skills, comprehension, application, analysis, synthesis, evaluation and understanding of the students), with 1 question from each module, having 5 marks for each question. Students shall answer all questions.

**Part B** contains 6 questions (such questions shall be useful in the testing of overall achievement and maturity of the students in a course, through long answer questions relating to theoretical/practical knowledge, derivations, problem solving and quantitative evaluation), with minimum one question from each module of which student shall answer any five. Each question can carry 6 marks. Total duration of the examination will be 120 minutes.

#### b) Pattern of End Semester Examination

- The maximum marks for End semester examination is 60 and duration is 2½ hours.
- The question paper will have two parts: Part A and Part B.

Part A will contain 5 numerical/short answer questions with 1 question from each module, having 5 marks for each question (such questions shall be useful in the testing of knowledge, skills, comprehension, application, analysis, synthesis, evaluation and understanding of the students). Students should answer all questions.

Part B will contain 7 questions (such questions shall be useful in the testing of overall achievement and maturity of the students in a course, through long answer questions relating to theoretical/practical knowledge, derivations, problem solving and quantitative evaluation), with minimum one question from each module of which student should answer any five. Each question can carry 7 marks.

### 3. RESEARCH METHODOLOGY & IPR/AUDIT COURSE

#### a) Continuous Internal Assessment : 40 Marks

Course based task:	<b>15 Marks</b>
Seminar/ Quiz:	<b>15 Marks</b>
Continuous assessment Test (CAT), 1 No: CAT shall include the first four modules of the syllabus	<b>10 Marks</b>
<b>Total</b>	<b>40 Marks</b>

#### Pattern of Continuous Assessment Test

- The maximum marks for Continuous assessment test is 50 and duration is 2 hours.

The question paper shall contain 6 questions, with minimum one question from each module, of which student should answer any four. Each question shall carry 12½ marks.



**b) Pattern of End Semester Examination**

- The maximum marks for End semester examination is 60 and duration is 2½ hours.

The question paper shall contain 7 questions, with minimum one question from each module, of which student should answer any five. Each question shall carry 12 marks.

**4. INDUSTRY ELECTIVES****a) Continuous Internal Assessment : 40 Marks**

Preparing a review article based on peer reviewed Original publications (minimum 10 publications shall be referred) :	<b>20 Marks</b>
Course based task/ Seminar/ Data collection and interpretation:	<b>10 Marks</b>
One Continuous assessment Test (CAT): CAT shall include the first four modules of the syllabus	<b>10 Marks</b>
<b>Total</b>	<b>40 Marks</b>

**Pattern of Continuous Assessment Test**

- The maximum marks for Continuous assessment test is 50 and duration is 2 hours.
- The question paper will have two parts: Part A and Part B.

**Part A** contain 4 questions (such questions shall be useful in the testing of knowledge, skills, comprehension, application, analysis, synthesis, evaluation and understanding of the students), with 1 question from each module, having 5 marks for each question. Students shall answer all questions.

**Part B** contains 6 questions (such questions shall be useful in the testing of overall achievement and maturity of the students in a course, through long answer questions relating to theoretical/practical knowledge, derivations, problem solving and quantitative evaluation), with minimum one question from each module of which student shall answer any five. Each question can carry 6 marks. Total duration of the examination will be 120 minutes.

**The continuous internal evaluation will be done by the expert in the industry/ the faculty handling the course**

**c) Pattern of End Semester Examination**

- The maximum marks for End semester examination is 60 and duration is 2½ hours.
- The question paper will have two parts: Part A and Part B.

Part A will contain 5 short answer questions with 1 question from each module, having 5 marks for each question (such questions shall be useful in the testing of knowledge, skills, comprehension, application, analysis, synthesis, evaluation and understanding of the students). Students should answer all questions.

Part B will contain 7 questions (such questions shall be useful in the testing of overall achievement and maturity of the students in a course, through long answer questions relating to theoretical/practical knowledge, derivations, problem solving and quantitative evaluation), with minimum one question from each module of which student should answer any five. Each question can carry 7 marks.

## 5. INTERNSHIP

### a) Continuous Internal Assessment : 50 Marks

Student's diary/ Daily Log:	<b>25 Marks</b>
Evaluation done by the Industry:	<b>25 Marks</b>
<b>Total</b>	<b>50 Marks</b>

### b) Pattern of End Semester Examination : 50 Marks

Internship Report	<b>25 Marks</b>
Comprehensive Viva Voce	<b>25 Marks</b>
<b>Total</b>	<b>50 Marks</b>

### b) LABORATORY COURSES

- The laboratory courses will be having only Continuous Internal Assessment and carries 100 marks.
- Final assessment shall be done by two examiners; one examiner will be a senior faculty from the same department.

### c) MINI PROJECT

#### a) Interim Evaluation: 40 Marks

- 20 marks for each review

#### b) Final Evaluation : 60 Marks

Evaluation by a Committee: (The committee will evaluate the level of completion and demonstration of functionality/specifications, clarity of presentation, oral examination, work knowledge and involvement).	<b>35 Marks</b>
Report: (The committee will evaluate the technical content, adequacy of references, templates followed and permitted plagiarism level is not more than 25%).	<b>15 Marks</b>
Supervisor/ Guide:	<b>10 Marks</b>
<b>Total</b>	<b>60 Marks</b>

**d) RESEARCH PROJECT/DISSERTATION**

Phase I:	Total marks: 100 marks, CIA = 100 marks
Phase II:	Total marks: 200 marks, CIA = 100 marks ESE = 100 marks
<b>Total</b>	<b>300 Marks</b>

**vi) Minimum Cumulative Credit Requirements for Registering to Higher Semesters**

Semester	Allotted credits	Cumulative credits	Minimum credits required
<b>M1</b>	18	18	Not Applicable
<b>M2</b>	18	36	Not Insisted
<b>M3</b>	16	52	12 credits from M1
<b>M4</b>	16	68	Not Insisted

**vii) Grade and Grade Points**

Grade	Grade Point (GP)	% of Total marks obtained in the Course
S	10	90% and above
A+	9	85% and above but less than 90%
A	8.5	80% and above but less than 85%
B+	8	75% and above but less than 80%
B	7.5	70% and above but less than 75%
C+	7	65% and above but less than 70%
C	6.5	60% and above but less than 65%
D	6	55% and above but less than 60%
P (Pass)	5.5	50% and above but less than 55%
F (Fail)	0	Below 50% (CIA + ESE) or below 45% for ESE
FE	0	Failed due to lack of eligibility criteria
AB	0	Could not appear for the ESE, but fulfils the eligibility criteria
I	0	Failure to submit the certificate of successful completion of MOOC by the end of Semester 3

**Calculation of SGPA/CGPA**

SGPA is calculated as below:

$$SGPA = \frac{\sum (C_i \times GP_i)}{\sum C_i}$$

where 'Ci' is the credit assigned for the course 'i' and 'GPi' is the grade point for that course. Summation is done for all courses registered by the student in the semester. The failed and incomplete courses shall also be considered in the calculation.

CGPA is calculated as below:

$$CGPA = \frac{\sum (C_i \times GP_i)}{\sum C_i}$$

where 'Ci' is the credit assigned for the course 'i' and 'GPi' is the grade point for that course. Summation is done for all courses specified in the Mar Baselios College of Engineering and Technology M.Tech Regulations 2022 13 curriculum up to that semester for which the 'CGPA' is needed. Here the failed courses shall also be accounted. CGPA for the M.Tech programme is arrived at by considering all course credits that are needed for the degree and their respective grade points.

SEMESTER I							
Slot	Course Type	Course Number	Course	Marks		Hours L - T - P	Credit
				CIA	ESE		
A	DCC	22MA060B	Linear Algebra and Optimization Techniques	40	60	3 – 0 - 0	3
B	PCC	22EE161A	Power Converter Circuits	40	60	3 – 0 - 0	3
C	PCC	22EE161B	Modelling of Electrical Machines	40	60	3 – 0 - 0	3
D	PEC	22EE1XXX	Program Elective 1	40	60	3 – 0 - 0	3
E	PEC	22EE1XXX	Program Elective 2	40	60	3 – 0 - 0	3
S	RM	22MC061A	Research Methodology & IPR	40	60	2 – 0 - 0	2
T	LBC	22EE169A	Power Electronics Lab	100	-	0 – 0 - 2	1
<b>Total</b>				<b>340</b>	<b>360</b>	<b>19</b>	<b>18</b>

Teaching Assistance: 6 hours

SEMESTER II							
Slot	Course Type	Course Number	Course	Marks		Hours L - T - P	Credit
				CIA	ESE		
A	DCC	22EE160A	Electric Drives	40	60	3 – 0 - 0	3
B	PCC	22EE161C	Design Principles of Power Converters	40	60	3 – 0 - 0	3
C	PEC	22EE1XXX	Program Elective 3	40	60	3 – 0 - 0	3
D	PEC	22EE1XXX	Program Elective 4	40	60	3 – 0 - 0	3
E	IEC	22EE1XXX	Industry/Interdisciplinary Elective	40	60	3 – 0 - 0	3
S	PR	22EE167A	Mini project	100	-	0 – 0 - 4	2
T	LBC	22EE169B	Electric Drives and Simulation Lab	100	-	0 – 0 - 2	1
<b>Total</b>				<b>400</b>	<b>300</b>	<b>21</b>	<b>18</b>

Teaching Assistance: 6 hours

**PROGRAMME ELECTIVES**

Slot	Category	Course Code	Course	L	T	P	Credit
<b>C, D, E</b>	<b>PEC</b>	22EE162A	Advanced Signal Processing	3	0	0	3
		22EE162B	Renewable Energy Technologies	3	0	0	3
		22EE162C	Flexible AC Transmission Systems	3	0	0	3
		22EE162D	Microcontroller Applications in Power Electronics	3	0	0	3
		22EE162E	Soft Computing Techniques	3	0	0	3
		22EE162F	PWM Schemes for Power Converters	3	0	0	3
		22EE162G	Dynamics of Linear Systems	3	0	0	3
		22EE162H	Application of Power Electronics in Power Systems	3	0	0	3
		22EE162I	Power System Protection	3	0	0	3
		22EE162J	Switch Mode Power Converters	3	0	0	3
		22EE162K	Power Electronics for Renewable Energy Systems	3	0	0	3
		22EE162L	Advanced Instrumentation	3	0	0	3
		22EE162M	Finite Element Methods for Electrical Machines	3	0	0	3
		22EE162N	EHVAC and DC Transmission	3	0	0	3
		22EE162O	Power Quality in Electrical Systems	3	0	0	3
		22EE162P	Hybrid and Electric Vehicles	3	0	0	3
		22EE162Q	SCADA Systems and Applications	3	0	0	3
		22EE162R	Special Electrical Machines and Drives	3	0	0	3
		22EE162S	Analysis, Design and Grid Integration of Photovoltaic Systems	3	0	0	3

**INTERDISCIPLINARY ELECTIVE**

Slot	Category Code	Course Number	Course Name	L	T	P	Credit	Offering Department
<b>E</b>	<b>IEC</b>	22EE165A	Solar and Wind Energy Conversion Systems	3	0	0	3	<b>EED</b>
		22EE165B	Electric Vehicle Technology	3	0	0	3	<b>EED</b>
		22EE165C	Process Control and Industrial Automation	3	0	0	3	<b>EED</b>
		22EE165D	Embedded Systems and Real Time Applications	3	0	0	3	<b>EED</b>
		22EE165E	Smart Grid and Energy Storage Systems	3	0	0	3	<b>EED</b>
		22EE165F	Electrical System Design and Building Services	3	0	0	3	<b>EED</b>

SEMESTER III							
Slot	Course Type	Course Number	Course	Marks		Hours L - T - P	Credit
				CIA	ESE		
TRACK 1							
A*	MOOC	----	MOOC	To be successfully completed		-	2
B	AC	22AC071A	Audit Course	40	60	3 – 0 - 0	-
C	PR	22EE177A	Internship	50	50	-	3
D	PR	22EE178A	Dissertation Phase I	100	-	0 – 0 - 17	11
TRACK 2							
A*	MOOC	----	MOOC	To be successfully completed		-	2
B	AC	22AC171A	Audit Course	40	60	3 – 0 - 0	-
C	PR	22EE177A	Internship	50	50	-	3
D	PR	22EE178A	Research project Phase I	100	-	0 – 0 - 17	11
Total				190	110	20	16

**Teaching Assistance: 6 hours**

\***MOOC** must be successfully completed before the commencement of fourth semester. This course can be carried out at any time from M1 to M3.

**AUDIT COURSES (we may think of adding more courses to this list)**

- English for Research Paper Writing
- Business Communication and Presentation Skills
- Ethics & Human Values
- Pedagogy Studies
- Stress Management by Yoga
- Personality Development through Life Enlightenment Skills
- Cost Management of Engineering Projects
- Operations Research
- Composite Materials
- Energy from Waste
- Entrepreneurship Development

**Track 1/ Track 2**

- In second year, the students can choose either of the two tracks: Track 1 or Track 2.
- Track 1 is conventional M.Tech programme

- Track 2 is M.Tech programme designed for students with scientific vigor for pursuing research and scientific knowledge.
- An aspirant in Track 2 needs to have a flavor for research and passion for the topic.
- The candidates should also be good with performing in-depth research and corroborating the conclusions of research conducted by them.
- Such students are expected to have the reasonable mastery of the following skills at the end of the M.Tech programme
  - Technical Skills
  - Research Skills
  - Communication Skills
  - Critical Thinking Skills
  - Problem Solving Skills.

### The eligibility for Track 2:

- Shall have qualified in the GATE or have a SGPA above 8.5 during the first semester of the M.Tech
- Qualify an interview during the end of second semester by an expert committee constituted for this purpose
- In the Research project track, the innovations in the research work shall be accepted or published in a journal (indexed in SCI/Unpaid SCOPUS) before the final evaluation. In case the student fails to satisfy this requirement, he/she will be evaluated only under Track 1.

SEMESTER IV							
Slot	Course Type	Course Number	Course	Marks		Hours L - T - P	Credit
				CIA	ESE		
TRACK 1							
D	PR	22EE178B	Dissertation Phase II	100	100	0 – 0 - 24	16
TRACK 2							
D	PR	22EE178B	Research project Phase II	100	100	0 – 0 - 24	16
Total				100	100	24	16

**Teaching Assistance: 5 hours**



{Subject to Approval by the competent Authorities}