Dr. Ambedkar Institute of Technology

Department of Medical Electronics Engineering

The enclosed documents are verified and approved.

A·P·N

HOD

Dr. Ambedkar Institute of Technology

Department of Medical Electronics Engineering

Name of the Course	Course Code	Activities/Content with direct bearing on Employability/ Entrepreneurship/ Skill development	Nature of Employability
Embedded & IOT Applications	18ML551	Employability	Programmer , Developer
Operation And Testing Medical Devices Lab	18MLLL67	Employability	Biomedical Engineer, Sales, Customer support Engineer ,Maintenance
Neural Network And Machine Learning	18ML71	Employability	Software Developer, Data Scientist
Biomechanics	ML73	Employability	Research & Development

Proceedings of the online BoS Meeting over Google Meet platform

The BoS Chairman welcomed the members on board. The same board members had devised the 2018 scheme defining the broader structure for the entire programme of Medical Electronics (2018 scheme) starting from 3rd sem. to 8th sem. The same committee had discussed in length and finalized the syllabus for the 3rd & 4th Sem. 5th & 6th sem. of 2018 scheme. The chair person reminded the members the same and placed before the committee the agenda for discussion.

1. Approval of the Curriculum for the 2020-21,2019-20,2018-19 batches
2. Review of 3rd & 4th sem. 5th & 6th Sem.
3. Scrutiny & approval of 7th & 8th sem. syllabus
4. Approval of subject list for BE Honours & Minors
5. Approval of BOE members & examiners panel

Agenda 1 was approved by the committee

Agenda 2

The syllabus of 3rd & 4th semesters were framed after detailed deliberations in the earlier BoS and no revisions were proposed in most of the subjects. The revised subjects are listed below:

18ML41 Microcontroller: The internal BoS had planned to update the syllabus by including MSP430 processor. The committee also approved the same. Dr. VG Sangam enquired about the lab facility for MSP 430 and since the lab resources are available it would be a better option. And Dr. Praful P Pai suggested to introduce ARM Processor through workshops and hands on training so that it may be gradually introduced as a processor of study. This could be mentioned in the syllabus and evaluated as an assignment exercise, to validate the study.

18ML42 Communication Systems: Simulations experiments on basic communication concepts using Simulink to enrich the understanding of the subject and to be evaluated as assignment

18MLL47 Microcontroller Lab: To include programming using both the processors. And Dr.Bhaskar Murary and Dr. ER Rajkumar suggested to change the sequences of exercises so that the students develop programming skills through simple application modules. The Part 1 to have software programs as existing and in Part 2 study of interfacing experiments can be made through group modular projects so that the students can realise application modules

combining interfacing and programming skills. This might help students to involve in developing applications at an early stage. Dr. N Sriraam expressed the concern that the average performers should be kept in mind while framing the contents. The syllabus is modified accordingly.

18ML551-Python Programming: New Professional elective is included as Learning Python programming skills are becoming inevitable from the industry point of view.
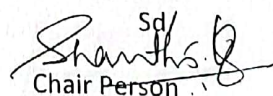
Agenda 3:

18Ml71 The internal BoS had proposed **Deep Learning** where the three units were on basics of Neural Network & Pattern recognition and introduced the concepts of Deep Learning in the last two units. The committee also approved the syllabus as understanding of Neural Networks is a prerequisite for Deep Learning. And Dr. Vijayalakshmi & Dr. N Sriraam proposed to change the subject title to **Neural Network & Machine Learning**, and the committee decided on the same. The Committee also proposed case study on the application, only then the students will visualize the subjects better. Mr. Tejas Venkatesh also expressed the case study should be based on image analysis while Mr. Pai added Biomedical Signal analysis also for the case study. The suggestions are incorporated and the case study will be evaluated through assignment.

Mr. Ayyappadas M shared his view on expanding the lab facilities for Biomedical Equipments. And he also pointed out that we have to get industry experts for each equipment so that the students acquire the right understanding. The point is noted and implemented as the department is in the process of setting up a new Lab.

The Alumni representative Varsha G expressed the opinion that the students should be briefed about the open electives so that they can make an appropriate choice. This concern will be shared with the college council.

The meeting concluded with the chair person thanking individual members for their invaluable time & support in coming up with a full fledged and competitive curriculum.

Date: 23/6/2021

Sd/
Chair Person

BOS Committee

Dr. Ambedkar Institute of Technology Bangalore 56

Department of Medical Electronics

BOS- X1 Dated 14/08/2020

Proceedings of the online BoS Meeting over Google Meet platform

The BoS Chairman welcomed the members on board. The same board members had devised the 2018 scheme defining the broader structure for the 2018 scheme starting from 3rd sem. to 8th sem. The same committee had discussed in length and finalized the syllabus for the 3rd & 4th Sem. of 2018 scheme. The chair person reminded the members the same and placed before the committee the agenda for discussion.

1. Feedback on PEO's & newly framed PSO's of the department
2. Approval of the Curriculum for the 2019-20,2018-19 and 2017-18 batches
3. Review of 3rd & 4th sem. Syllabus & 7th & 8th Sem. syllabus
4. Scrutiny & approval of 5th & 6th sem. syllabus
5. Approval of subject list for BE Honours & Minors
6. Approval of BOE members & examiners panel

Agenda 1 is being circulated among the members and awaited for specific remarks. Overall the PEO's & PSO's were accepted.

Agenda 2 The curriculum was approved for all the three batches

Agenda 3 Review of 3rd & 4th sem. the board member Mr. Santhosh Lawrence General Manager WIPRO-GE observed that 18 ML36 OOPs the theory & lab occur in two different semesters. The Chairperson explained it is because the department has to adhere to stipulated credits per semester, and any one of the labs from 3rd sem. had to be advanced to 4th sem. and however the subject assignment programs have to be verified practically. The syllabus of 3rd & 4th sem. was approved. Syllabus for 7th & 8th Sem. ML73 Biomechanics was introduced as a core subject by adjusting credits from ML71 BMDSP, ML72 DIP & MLL76 BMDSP Lab. The internal BoS had decided to introduce Biomechanics, as this was one of the subjects in GATE 2020 where Biomedical Instrumentation was introduced for the first time. The same was approved by the committee.
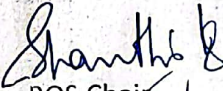
Agenda 4 Control Systems & Physiological Control Systems were combined together to form 18ML53 Physiological Control Systems for 4 credits, the syllabus was discussed and approved.

Dr. Vijayalakshmi Prof. & HOD Medical Electronics, BMSCE suggested to rename Medical Electronics lab to a more specific one such as Biomedical Instrumentation Lab 18MLL57 and the same is adapted. Similarly 18MLL59 BMDSP lab since it covers image processing and biomedical signals it was felt that the same may be reflected in the title of the lab also. Hence it was agreed to rename the lab as Biomedical Digital & Image Processing Lab. There was a detailed discussion on Medical Physics 18 ML64 and Medical Imaging Systems 18ML52 and agreed to accept the syllabus. 18ML62 LFO syllabus was reviewed and suggestions by Dr. Bhaskar Mohan Murary, Professor, School of Biosciences & Technology , VIT Vellore, is incorporated. A New lab 18MLL67 Operation & Testing of Medical Devices lab was introduced to introduce the skill in repairing & maintenance of the devices.

Agenda 5 The list of subjects for BE honours & Minors degree was approved

Agenda 6 The list of BOE members & examiners panel was approved

The Chairman thanked the BoS members for their interaction and valuable contribution.

BOS Chair

Dr. Ambedkar Institute of Technology, Bangalore-560056

Department of Medical Electronics Engineering

Details of Curriculum Design Under Autonomy for UG Program 2019-20 Batch

BOS XI (2020) Date: 14/8/2020

Sl No	Category	Number of Credits								Credit range as per VTU guideline (175 Credits)	Actual Credit Allocation
		Sem I & II	Sem III	Sem. IV	Sem. V	Sem. VI	Sem. VII	Sem. VIII			
A	Humanities And Social Sciences	02	01	01	03	3	2	2	5-10	14
B	Basic Sciences	18	03	03					10-20	24
C	Engineering Sciences	20	09			3			10-20	32
D	Professional Subjects- Core		11	20	16	10	10		30-40	67
E	Professional Subjects- Elective				3	3	6		10-15	12
F	Other Elective- Inter department				3	3	3		5-10	9
G	Project Work+ Seminar + Project tour					2	2	13	10-15	17
	Total no of subjects/components	16	12	11	8	10				
	Total No of Credits	40	24	24	25	24	23	15		175

DEAN (ACADEMIC)

CHAIRMAN/ACADEMIC COUNCIL

CHAIRMAN/BOS

Dr. Ambedkar Institute of Technology, Bangalore-560056

Department of Medical Electronics Engineering

Details of Curriculum Design Under Autonomy for UG Program 2018-19 Batch

BOS XI (2020) Date: 14/8/2020

Sl. No	Category	Number of Credits								Credit range as per VTU guideline (175 Credits)	Actual Credits Allocation
		Sem. I & II	Sem. III	Sem. IV	Sem. V	Sem. VI	Sem. VII	Sem. VIII			
A	Humanities And Social Sciences	02	01	01	03	3	2	2	5-10	14
B	Basic Sciences	18	03	03					10-20	24
C	Engineering Sciences	20	09			3			10-20	32
D	Professional Subjects-Core		11	20	16	10	10		30-40	67
E	Professional Subjects-Elective				3	3	6		10-15	12
F	Other Elective- Inter department				3	3	3		5-10	9
G	Project Work+ Seminar + Project tour					2	2	13	10-15	17
	Total no of subjects/components	16	12	11	8	10				
	Total No of Credits	40	24	24	25	24	23	15		175

CHAIRMAN/BOS

DEAN (ACADEMIC)

CHAIRMAN/ACADEMIC COUNCIL

Dr. Ambedkar Institute of Technology, Bangalore-560056

Department of Medical Electronics Engineering

Details of Curriculum Design Under Autonomy for UG Program 2017-18 Batch

BOS XI (2020) Date: 14/8/2020

SI No	Category	Number of Credits							Credit range as per VTU guideline (200 Credits)	Actual Credit Allocation
		Sem. I & II	Sem. III	Sem. IV	Sem. V	Sem. VI	Sem. VII	Sem. VIII		
A	Humanities And Social Sciences	04			04		02		10-20	10
B	Basic Sciences	19	04	04					30-40	27
C	Engineering Sciences	27	22						30-40	49
D	Professional Subjects-Core			21	17	20	10		60-80	68
E	Professional Subjects-Elective				4	04	06	08	20-30	22
F	Other Elective- Inter department						04	04	10-20	08
G	Project Work+ Seminar + Project tour					02	02	12	20-30	16
	Total no of subjects/components	16	09	08	08	09	10	04		
	Total No of Credits	50	26	25	25	26	24	24		200

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DEAN (ACADEMIC)

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Curricula 2017-

Dr. Ambedkar Institute of Technology, Bangalore-560056

Department of Medical Electronics Engineering

Details of Curriculum Design Under Autonomy for UG Program 2018-19 Batch

BOS 10 (2019) Date: 27/5/2019

Sl No	Category	Number of Credits								Percentage of total Credits as per VTU guideline (175 Credits)	Actual Credit Allocation
		Sem. I & II	Sem. III	Sem. IV	Sem. V	Sem. VI	Sem. VII	Sem. VIII			
A	Humanities And Social Sciences	02	01	01	03	03	02	02	5-10	14
B	Basic Sciences	18	03	03					10-20	24
C	Engineering Sciences	20	03		03				15-20	26
D	Professional Subjects-Core		17	20	15	13	09		30-40	74
E	Professional Subjects-Elective				03	03	06		10-15	12
F	Other Elective- Inter department					03	03	03	5-10	09
G	Project Work+ Seminar + Project tour						02	11	10-15	16
	Total no of subjects/components	16	12	11	08	10	08	05		
	Total No of Credits	40	24	24	24	25	22	16		175

CHAIRMAN/BOS

DEAN (ACADEMIC)

CHAIRMAN/ACADEMIC COUNCIL

Dr. Ambedkar Institute of Technology, Bangalore-560056

Department of Medical Electronics Engineering

Details of Curriculum Design Under Autonomy for UG Program 2017-18 Batch

BOS 10 (2019) Date: 27/5/2019

Sl No	Category	Number of Credits							Credit range as per VTU guideline (200 Credits)	Actual Credit Allocation
		Sem. I & II	Sem. III	Sem. IV	Sem. V	Sem. VI	Sem. VII	Sem. VIII		
A	Humanities And Social Sciences	04			04		02		10-20	10
B	Basic Sciences	19	04	04					30-40	27
C	Engineering Sciences	27	22						30-40	49
D	Professional Subjects-Core			21	17	20	09		60-80	67
E	Professional Subjects-Elective				4	04	07	08	20-30	23
F	Other Elective- Inter department						04	04	10-20	08
G	Project Work+ Seminar + Project tour					02	02	12	20-30	16
	Total no of subjects/components	16	09	08	08	09	09	04		
	Total No of Credits	50	26	25	25	26	24	24		200

DEAN (ACADEMIC)

CHAIRMAN/ACADEMIC COUNCIL

CHAIRMAN/BOS
27/5

Dr. Ambedkar Institute of Technology, Bangalore-560056

Department of Medical Electronics Engineering

Details of Curriculum Design Under Autonomy for UG Program 2016-17 Batch

BOS 10 (2019) Date: 27/5/2019

Sl. No	Category	Number of Credits							Credit range as per VTU guideline (200 Credits)	Actual Credit Allocation
		Sem. I & II	Sem. III	Sem. IV	Sem. V	Sem. VI	Sem. VII	Sem. VIII		
A	Humanities And Social Sciences	04			04		02		10-20	10
B	Basic Sciences	19	04	04					30-40	27
C	Engineering Sciences	27	22						30-40	49
D	Professional Subjects-Core			21	17	20	09		60-80	67
E	Professional Subjects-Elective				4	04	07	08	20-30	23
F	Other Elective- Inter department						04	04	10-20	08
G	Project Work+ Seminar + Project tour					02	02	12	20-30	16
	Total no of subjects/components	16	09	08	08	09	09	04		
	Total No of Credits	50	26	25	25	26	24	24		200

DEAN (ACADEMIC)

CHAIRMAN/ACADEMIC COUNCIL

CHAIRMAN BOS
2/9/5

Dr. Ambedkar Institute of Technology, Bengaluru-56

Department of Medical Electronics

BoS-9 : 23-06-2018

Proceedings of the BoS-9 meeting

The BoS Chairperson welcomed the members for the meeting. There was a brief self-introduction by all the members. The BoS chair gave an introductory remark about the autonomy practice and earlier BoS.

The chair also brought-forth the outcomes from the meetings and the consequent meetings of the internal BoS. The BoS approved all the suggestions from the internal Bos.

The modifications suggested and outcome of the meetings are as listed below:

➢ The laboratory experiments need not be title specific, only objectives to be given.

➢ Sensors and Measurement (ML34)-The study of equipments could be practical oriented.

➢ Microcontrollers (ML41) - Theory sessions could also be made hands on using the simulation software this gives a better understanding of the theoretical aspects.

➢ Medical science (ML44) - Anatomy and Physiology laboratory may be setup displaying models of human systems. And theory could be supported by animation videos

➢ Embedded C (ML551) - IOT applications to be added as one unit and the introductory unit to be made as review only. Title of the subject to be modified as Embedded Systems & IOT. And industry expert from Bosch offered assistance in framing the IOT syllabus

➢ Lasers and Fiber Optics in Medicine (ML64) -Reframing/Re-organization of the Units in the syllabus.

➢ Wherever necessary the introduction if repeating it could be given as review for minimum hrs. and questions need not be asked on review portions.

The board approved the proposed scheme for the revised curriculum to be effective from 2018-19. The board also approved the list of BOE members.

The Chairperson thanked all the members for their commitment and contribution in revising the syllabus.

Shanthi. &

Signature of the Chairman

Head of the Department
Dept. of Medical Electronics
Dr.Ambedkar Institute of Technology
Bangalore 560 056.

Dr. Ambedkar Institute of Technology, Bangalore-560056

Department of Medical Electronics Engineering

Details of Curriculum Design Under Autonomy for UG Program 2015-16 Batch

BOS 9 (2018) Date: 23/6/2018

Sl No	Category	Number of Credits							Credit range as per VTU guideline (200 Credits)	Actual Credit Allocation
		Sem I & II	Sem III	Sem. IV	Sem. V	Sem. VI	Sem. VII	Sem. VIII		
A	Humanities And Social Sciences	04			04		02		10-20	10
B	Basic Sciences	19	04	04					30-40	27
C	Engineering Sciences	27	22						30-40	49
D	Professional Subjects-Core			21	21	18	11		60-80	71
E	Professional Subjects-Elective					04	07	08	20-30	19
F	Other Elective- Inter department						04	04	10-20	08
G	Project Work+ Seminar + Project tour					02	02	12	20-30	16
	Total no of subjects/components	16	09	08	09	09	9	04		
	Total No of Credits	50	26	25	25	26	24	24		200

CHAIRMAN/BOS   DEAN (ACADEMIC)   CHAIRMAN/ACADEMIC COUNCIL

Dr. Ambedkar Institute of Technology, Bangalore-560056

Department of Medical Electronics Engineering

Details of Curriculum Design Under Autonomy for UG Program 2016-17 Batch

BOS 9 (2018) Date: 23/6/2018

Sl. No	Category	Number of Credits							Credit range as per VTU guideline (200 Credits)	Actual Credit Allocation
		Sem. I & II	Sem. III	Sem. IV	Sem. V	Sem. VI	Sem. VII	Sem. VIII		
A	Humanities And Social Sciences	04			04		02		10-20	10
B	Basic Sciences	19	04	04					30-40	27
C	Engineering Sciences	27	22						30-40	49
D	Professional Subjects-Core			21	17	20	09		60-80	67
E	Professional Subjects-Elective				4	04	07	08	20-30	23
F	Other Elective- Inter department						04	04	10-20	08
G	Project Work+ Seminar + Project tour					02	02	12	20-30	16
	Total no of subjects/components	16	09	08	08	09	09	04		
	Total No of Credits	50	26	25	25	26	24	24		200

CHAIRMAN/BOS

DEAN (ACADEMIC)

CHAIRMAN/ACADEMIC COUNCIL

Dr. Ambedkar Institute of Technology, Bangalore-560056

Department of Medical Electronics Engineering

Details of Curriculum Design Under Autonomy for UG Program 2017-18 Batch

BOS 9 (2018) Date: 23/6/2018

Sl No	Category	Number of Credits							Credit range as per VTU guideline (200 Credits)	Actual Credit Allocation
		Sem. I & II	Sem. III	Sem. IV	Sem. V	Sem. VI	Sem. VII	Sem. VIII		
A	Humanities And Social Sciences	04			04		02		10-20	10
B	Basic Sciences	19	04	04					30-40	27
C	Engineering Sciences	27	22						30-40	49
D	Professional Subjects-Core			21	17	20	09		60-80	67
E	Professional Subjects-Elective				4	04	07	08	20-30	23
F	Other Elective- Inter department						04	04	10-20	08
G	Project Work+ Seminar + Project tour					02	02	12	20-30	16
	Total no of subjects/components	16	09	08	08	09	09	04		
	Total No of Credits	50	26	25	25	26	24	24		200

DEAN (ACADEMIC)

CHAIRMAN/ACADEMIC COUNCIL

CHAIRMAN-BOS

Dr. Ambedkar Institute of Technology

Department of Medical Electronics

BoS VIII

18/03/2017

Proceedings of the Meeting:

The BoS chair person welcomed the members for the meeting. There was a brief self introduction by all the members. The BoS Chair gave an introductory remark about the autonomy practice and earlier BoS.

The chair also brought-forth the outcomes from the internal meetings and the consequent meetings of internal BoS.
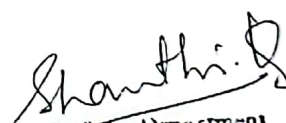
The modifications suggested are as listed below outcome of the meeting

> AEC ML 31: The suggestion was to replace the BJT analysis with the FET Analysis

> Network Analysis ML33: To include simulation tool wherever necessary and this has to be assessed for assignment

> EI ML34: To include biomedical sensors, to delete the ac bridges but for the concepts. Topics on CRO and signal generators to be refined to include Digital scopes and RF sources & interferences. And a study experiment to demonstrate the different errors. The experiment to be given as an assignment. Testing & calibration to be included and the same topic to be handled by industry persons in the calibration field. And again second assignment can be based on the industry lecture. And a suggestion to relook into the title of the subject.

> OOPS Lab MLL36: Problem statements to be defined based on applications, which may include one or many experiments. This applies in general to all the labs where the experiment titles need to be carefully modified to show the design and verification.

- Microcontroller ML41:   Typical case study for medical electronics application in unit 3 making use of the interface components studied (Block Diagram level)
- Physiological control systems ML53:   The simulation of physiological models using   Simulink to be included. And this can be evaluated as assignment.
- Embedded C ML551:   Unit V: For the case study include   typical embedded application development based on Arduino boards.
- Medical Informatics ML652: Cloud concepts for the medical data storage to be included. And an expert lecture may be arranged on this.
- BMDSP ML71: Sleep EEG to be included as an industry component and invite experts from NIMHANS
- ADSP MLL75: To be renamed as BMDSP Lab (Biomedical signal processing Lab)

The outcomes from the internal BoS were also discussed and approved.

- To advance Java Lab MLL76 from VII sem. to VI sem.
- To advance seminar MLS83 from VIII sem. To VII sem.

Head of the Department
Dept. of Medical Electronics
Dr.Ambedkar Institute of Technology
Bangalore 560 056.

Dr. Ambedkar Institute of Technology, Bangalore-560056

Department of Medical Electronics Engineering

Details of Curriculum Design Under Autonomy for UG Program 2016-17 Batch

BOS 8 (2017) Date: 18/03/2017

Sl No	Category	Number of Credits							Credit range as per VTU guideline (200 Credits)	Actual Credit Allocation
		Sem. I & II	Sem. III	Sem. IV	Sem. V	Sem. VI	Sem. VII	Sem. VIII		
A	Humanities And Social Sciences	04			04		02		10-20	10
B	Basic Sciences	19	04	04					30-40	27
C	Engineering Sciences	27	22						30-40	49
D	Professional Subjects-Core			21	17	20	09		60-80	67
E	Professional Subjects-Elective				4	04	07	08	20-30	23
F	Other Elective- Inter department						04	04	10-20	08
G	Project Work+ Seminar + Project tour					02	02	12	20-30	16
	Total no of subjects/components	16	09	08	08	09	09	04		
	Total No of Credits	50	26	25	25	26	24	24		200

DEAN (ACADEMIC)

CHAIRMAN/ACADEMIC COUNCIL
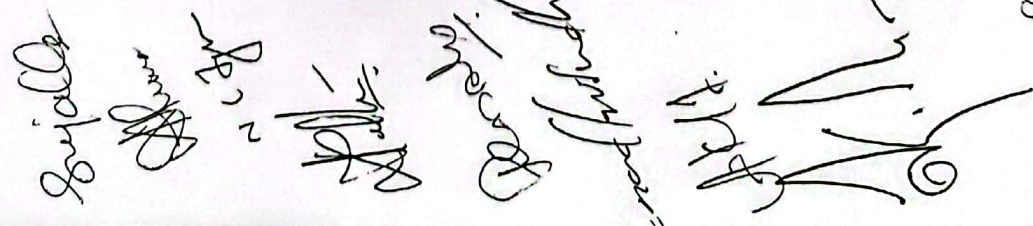
CHAIRMAN/BOS

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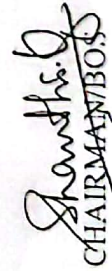Dr. Ambedkar Institute of Technology, Bangalore-560056

Department of Medical Electronics Engineering

Details of Curriculum Design Under Autonomy for UG Program 2015-16 Batch

BOS 8 (2017) Date: 18/03/2017

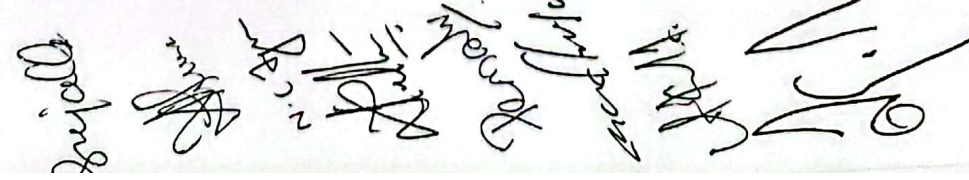| Sl. No	Category	Number of Credits							Credit range as per VTU guideline (200 Credits)	Actual Credit Allocation
		Sem. I & II	Sem. III	Sem. IV	Sem. V	Sem. VI	Sem. VII	Sem. VIII		
A	Humanities And Social Sciences	04			04		02		10-20	10
B	Basic Sciences	19	04	04					30-40	27
C	Engineering Sciences	27	22						30-40	49
D	Professional Subjects- Core			21	17	20	09		60-80	67
E	Professional Subjects- Elective				4	04	07	08	20-30	23
F	Other Elective- Inter department						04	04	10-20	08
G	Project Work+ Seminar + Project tour					02	02	12	20-30	16
	Total no of subjects/components	16	09	08	08	09	09	04		
	Total No of Credits	50	26	25	25	26	24	24		200

DEAN (ACADEMIC)

CHAIRMAN/ACADEMIC COUNCIL

CHAIRMAN/BOS

Dr. Ambedkar Institute of Technology, Bangalore-560056

Department of Medical Electronics Engineering

Details of Curriculum Design Under Autonomy for UG Program 2014-15 Batch

BOS 8 (2017) Date: 18/03/2017

Sl No	Category	Number of Credits								Credit range as per VTU guideline (200 Credits)	Actual Credit Allocation
		Sem I & II	Sem III	Sem. IV	Sem. V	Sem. VI	Sem. VII	Sem. VIII			
A	Humanities And Social Sciences	04			04		02			10-20	10
B	Basic Sciences	19	04	04						30-40	27
C	Engineering Sciences	27	22							30-40	49
D	Professional Subjects-Core			21	21	18	11			60-80	71
E	Professional Subjects-Elective					04	07	08		20-30	19
F	Other Elective- Inter department						04	04		10-20	08
	Project Work+ Seminar + Project tour					02	02	12		20-30	16
	Total no of subjects/components	16	09	08	09	08	10	04			
	Total No of Credits	50	26	25	25	24	26	24			200

DEAN (ACADEMIC)

CHAIRMAN/BOS

CHAIRMAN/ACADEMIC COUNCIL.

Sub Title: EMBEDDED SYSTEMS & IOT APPLICATIONS		
Sub Code: 18ML551	**No of Credits : 3= 3:0: 0(L-T-P)**	**No of lecture hours/week :3**
Exam Duration : 3 hours	**CIE + Assignment + SEE =45+5+50=100**	**Total no of contact hours:39**

COURSE OBJECTIVES :To make the student learn

1.The concepts of embedded programming in the context of 8051
2 .Design constraints of 8051 for embedded applications
3. Embedded C
4. TI Processor- MSP 430

Unit No	Syllabus Content	No of Hours
1	**Introduction to Embedded Systems** Embedded system, Choice of processor, programminglanguage and operating system, Conclusions **Reading Switches:** Introduction, Basic techniques for reading from port pins, Example: Reading and writing bytes,Example: Reading and writing bits (simple version), Example: Reading and writing bits (genericversion), The need for pull-up resistors, Dealing with switch bounce, Example: Reading switch inputs(basic code), Example: Counting goats, Conclusions**.	7
2	**Adding Structure to the Code** Introduction, Object-oriented programming with C, The Project Header (MAIN.H), The Port Header(PORT.H), Examples	8
3	**MSP430G2553:** Block diagram and study. **MSP EXP 430 G2 Launch Pad –** components. **Examples-** LED control using a switch, serial communication	8
4	**Interfacing**: seven segment displays and Liquid Crystal displays with MSP430, Introduction to MSP 430 timer modules and its modes of operation, generating Pulse Width Modulation using Timer Capture Mode. ADC	8
5	**Internet of Things** Embedded Systems-an overview, features. Networked Embedded System-types and overview, wireless communication standards-zigbee, Bluetooth & Wi-Fi. OSI & TCP/IP model in a nutshell. Introduction to the Internet and understand how internet works. Introduction to Smart Objects or Things. **IOT applications** IOT- understand what IOT is and discuss its application in health-care systems- Patient Monitoring & diagnostics, Home healthcare & Personal care & Fitness. Case Study: Wireless Patient Monitor system. Application Design: Design of IOT based pulse oximeter, block diagram, concepts of analog front end, signal process and Wi-Fi integration.	8

Note 1: No questions on Review portions from Unit 1

Note 2: Assignment-1 from unit 1 and 2.
        Asssignment-2   Reports based on Training on MSP 430 & IOT Applications

COURSE OUTCOMES: The student will be able to

CO1: Design and development of embedded system using microcontroller 8051

CO2:Apply the programming skills of embedded C for any microcontroller

CO3: Understand TI -MSP430 processor and   develop coding using the launch pad

CO4: Design & Develop interfacing applications using MSP 430

CO5: Understand the fundamentals of IOT protocols & IOT applications

Cos	Mapping with Pos
CO1	PO3,PO4,
CO2	PO3,PO4,
CO3	PO3,PO4,PO5,PO12
CO4	PO5, PO12
CO5	PO3, PO4,PO5, PO12

TEXT BOOKS:

1. Embedded C - Michael J. Pont, 2nd Ed., Pearson Education, 2008

2. TI- MSP430 Launch Pad Manual

REFERENCE BOOKS:

1. PICmicro MCU C-An introduction to programming, The Microchip PIC in CCS C - Nigel

Gardner

2. Getting Started with Internet of Things- CunoPfister, 2011

3. Interconnecting Smart Objects with IP- J. P Vasseur, Adam Dunkels, 2010

Sub Title : OPERATION & TESTING OF MEDICAL DEVICES LAB		
Sub Code: 18MLL67	No. of Credits:1=0: 0:1(L-T-P)	No of lecture hours/week :03
Exam Duration : 3	Exam Marks : 50	

Course Objectives:To enable the students to
- understand the usage of state of art equipments in the hospital
- To make the students learn troubleshooting
- Operation and Testing of Medical Devices Lab

1	Hospital visit for a minimum period 10 days to be carried out either in the beginning of the sixth semester or phased out during the semester. The report submitted should include the detailed study of equipments with respect to specification, cost & make apart from the operation and testing procedure in the following labs in the hospital: • Biochemistry lab, Pathology Lab • Opthalmology lab • Radiology lab • Dialysis lab • OT • ICU, NICU • Physiotherapy • Ventilator • Safety standards & medical ethics
2	Need for Calibration of Medical Devices. Calibrating Devices
3	Troubleshooting of X Ray machine, ECG machine
4	DC power supply, different types grounding & shielding mechanisms
5	Hands-on Workshop on Calibration & Testing of Medical Devices

Course Outcome:
On completion of the course the student will be able to
CO1: Understand the Practical use of equipments& its operating Procedures
CO2: Apply the latest trend in the technology and the state of the art technology
CO3: Develop an understanding of the global companies in the market their device specification& idea of cost of the products
CO4: Understand the safety standards and medical ethics
CO5: Understand and perform the procedures of trouble shooting & Calibration
CO6: Make effective presentation & documentation

Cos	Mapping with Pos
CO1	PO1,PO2,PO3
CO2	PO3, PO4, PO12
CO3	PO11, PO12
CO4	PO8, PO12
CO5	PO9,PO10, PO12
CO6	PO9,PO10, PO11, PO12

NEURAL NETWORK & MACHINE LEARNING		
Sub Code: 18ML71	No. of Credits : 3=3: 0: 0(L-T-P)	No of lecture hours/week :03
Exam Duration : 3 hours	CIE+Assignment+SEE =45+5+50=100	Total no of contact hours:39

COURSE OBJECTIVES: The enable the students to learn
1. The concepts of biological neuron and analogy to the artificial neuron model
2. Different neural network architecture
3. Various learning paradigms and comparisons

UNIT No	Syllabus Content	No of Hours
1	**ARTIFICIAL NEURAL NETWORK:** introduction to artificial neural network, model of a neuron, Types of activation function, neural networks viewed as directed graphs, architectural graph of a neuron with feedback, Network Architectures, Artificial intelligence and Neural Networks. **SINGLE LAYER PERCEPTION:** Introduction, Adaptive filtering problem, Unconstrained optimization techniques, Newton's method, Gauss-Newton method, Linear least square filter, Least mean square algorithm, Learning curves, Learning Rate, Annealing techniques, Perceptron, convergence theorem	7
2	MULTILAYER PERCETRON:Introduction, Some Preliminaries, Back propagation algorithm, XOR Problem, Heuristics for making the back propagation algorithm perform better, Feature detection, Hessian matrix, generalization, Cross validation, Virtues and limitations of back propagation algorithm	8
3	**Random Variables-**Binomial distribution, Poission distribution Continuous Random variables uniform density, exponential density, normal density **Introduction to pattern Recognition** **Statistical Decision Making:** Introduction, Bayes' theorem, multiple features, conditionally independent features, Decision boundaries: Two Dimensional decision boundaries **Clustering:** Introduction, Hierarchical clustering-agglomerative, single linkage, average linkage, ward's method. Partitional clustering-Forgy's, k-means.	8
4	Introduction to Deep Learning, Bayesian Learning, Decision Surfaces Linear Classifiers, Linear Machines with Hinge Loss Unsupervised Learning with Deep Network, Autoencoders Convolutional Neural Network, Building blocks of CNN, Transfer Learning Revisiting Gradient Descent, Momentum Optimizer, Effective training in Deep Net- early stopping, Dropout, Batch Normalization, Instance Normalization, Group Normalization	8

5	Recent Trends in Deep Learning Architectures, Residual Network, Skip Connection Network, Fully Connected CNN etc. Classical Supervised Tasks with Deep Learning, Image Denoising, Semantic Segmentation, Object Detection etc.LSTM NetworksGenerative Modeling with DL, VariationalAutoencoder, Generative Adversarial Network Revisiting Gradient Descent, Momentum Optimizer.	8

Note1: **Assignment-1 from unit 1 and 2.**
Asssignment-2 from unit 3,4 and 5

COURSE OUTCOMES: On completion of the course the student will be able to
CO1: Understand the concepts neural network and different learning algorithms.
CO2: Apply perceptron and multiple perceptron for classification.
CO3: Apply the probabilistic models for data classification.
CO4: Understand   the concepts of CNN
CO5: Apply   Deep Learning for classification through case studies

Cos	Mapping with Pos
CO1	PO1,PO2,PO4, PO6, PO7,PO12
CO2	PO2,PO3,PO4,PO6, PO7, PO12
CO3	PO2,PO3,PO4, PO6, PO7, PO12
CO4	PO2,PO3,PO4, PO6, PO7, PO12
CO5	PO2,PO3,PO4,PO6, PO7, PO12

TEXT BOOKS:
1. **An Introduction To Neural Networks,**James A. Anderson, PHI, 2nd edition ,1995.
2. **Neural Networks**, Simon Haykin Pearson Education/PHI, 2001.
3. **Neural Networks** , Satish Kumar, Tata Mcgraw-hill 2009
4. **Pattern Recognition & Image Analysis**, Earl Gose, Richard Johnsonbaugh Steve Jost, Prentice Hall of India.

REFERENCE BOOKS:
1.Deep Learning- Ian Good felllow, YoshuaBenjio, Aaron Courville, The MIT Press
2.Pattern Classification- Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc.

Sub Title : BIOMECHANICS		
Sub Code: ML73	No of Credits :3= 3: 0: 0(L-T-P)	No of lecture hours/week : 3
Exam Duration : 3 hours	CIE+Assignment+SEE =45+5+50=100	Total no of contact hours:39

COURSE OBJECTIVES: Understand the mechanical aspects of human motion:
1. Quantitative and qualitative analysis of human motion and performance.
2. Use physical laws of motion to solve problems of human motion.
3. Understand the relationship between mechanical properties and anatomical functions.
4. Understand how biomechanical principles can be applied to examine human activities such as sport and orthopaedic rehabilitation.

UNIT No	Syllabus Content	No of Hours
1	**BIO-FLUID MECHANICS:** Newton's laws, stress, strain, elasticity, Hook's-law, viscosity, Newtonian Fluid, Non-Newtonian fluid, viscoelastic fluids. Vascular tree. Relationship between diameters, velocity and pressure of blood flow, Resistance against flow	08
2	**VISCOELASTIC FLUID:** Viscoelasticity, Viscoelastic Models: Maxwell, Voigt and Kelvin Models Response to harmonic variation. Use of viscoelastic models.	08
3	**RESPIRATORY MECHANICS:** Alveoli mechanics, Interaction of blood and lung P-V curve of lung. Breathing mechanism. Airway resistance. Physics of lung diseases.	08
4	**ORTHOPEDIC MECHANICS:** Mechanical properties of cartilage. Diffusion properties of articular, cartilage, Mechanical properties of bone. Kinetics and Kinematics of joints, Lubrication of joints. Fundamental concepts of Gait analysis.	08
5	Measuring principles of Cutometer, Durometer. Electrodynamometer, Microindentometer&Ballistometer.	07

Note1: Assignment-1 from unit 1 and 2.
      Asssignment-2 from unit 3, 4 and 5

COURSE OUTCOMES: On the completion of the course the students will be able to
CO1: Understand the concepts of bio-fluids.
CO2: Understand the various viscoelastic models.
CO3: Understand the concepts of respiratory mechanics
CO4: Understand the concept of orthopaedic mechanics.
CO5: Understand the principles of various biomechanic measuring equipments.

COs	Mapping with POs
CO1	PO1,PO2,PO3,PO4
CO2	PO2,PO3,PO4
CO3	PO1,PO4, PO6, PO7
CO4	PO1,PO4,PO7
CO5	PO1,PO4,PO7

TEXT BOOKS:
1. **Biomechanics, Mechanical Properties of Living Tissues,**Y.CFung,SpringerVerlag, Edition2, 1993.
2. **Introduction to Biomechanics of Joints & Joint Replacement Mechanical Engg,** D.Dowson, V Wright publication, 1987.
3. **The Biomedical Hand Book**,Joseph.D.Bronzino ,CRC Press, 2nd Edition,2000.