DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
Biomedical Engineering

Minutes of BoS meeting for B.Tech Biomedical Engineering on 12-04-2016

Agenda:

- B.Tech Syllabus & course Structure (Bio-Medical Engineering)

The following members were present for the Board of studies meeting held on 12th April 2016 at office of Head of the Department, Department of Electronics and Communication Engineering (Biomedical Engineering), Vignan's University, Vadlamudi, Guntur.

BoS Members:

1. Dr. G. Jeevana Latha, Gynecologist, Health Hospitals, Tenali.
2. Mr. S. Kumar, CEO, TMI Systems, Bangalore.
3. Dr. Rama Subba Reddy, Professor, Dept. of Applied Engineering, IIT Madras.
4. Mr. K. Srikanth, Director, Graphic Devices and Novavid Systems, Bangalore
5. Dr. V. Vasudeva Rao, Professor, VR Siddhartha Engg College, Vijayawada.
6. Dr. N. Usha Rani, Professor & HoD, Department of ECE, Vignan's University.

Dr. N. Usha Rani welcomed all Board of studies members and she briefly explained the background work she has done for this course. The following discussions took place prior to approving the curriculum for B.Tech Biomedical Engineering.

The comments given by the following BoS members

1. Dr. G. Jeevana Latha, Gynecologist, Health Hospitals, Tenali

- She mentioned that instead of allotting Anatomy and physiology as separate subjects she suggested to include them as same subject.
- She also mentioned to include the subject Pathology and Microbiology and subjects such as biostatistics.
- It would be also necessary to include Biostatistics as one of the main courses

2. Mr. S. Kumar, CEO, TMI Systems, Bangalore.

- He mentioned that the LTI systems are to be included and to be discussed in depth and also said to include Z-transforms analysis.
- In Transducers and biosensors subjects it was discussed to add signal conditioning and signal analyzer and also display and recording devices.
- He felt that medical physics is of greatest importance now a days in the modern diagnostics instruments.

3. Dr. Rama Subba Reddy, Professor, Dept. of Applied Engineering, IIT Madras.

- He suggested to add data and pulse communication, source and error control coding multi user radio communication
- In the course microprocessor and interfacing, instruction set, assembly language programming is of more important to the modern electronics and motor electronic interfacing.
- He advised to append the subjects Biomechanics, Biomems, Biomedical signal processing and biocontrol systems.

4. Mr. K. Srikanth, Director, Graphic Devices and Novavid Systems, Bangalore

- In the emerging technological advancements industry will face a technology challenge of implementing novel techniques, which are of proprietary interests. So we have to let the graduates know about the importance of the intellectual property rights.
- Assist devices, fiber optics and lasers in medicine, are more frequently applied subjects in the field of medical electronics. So the engineers can be better equipped with the knowledge on them.

5. Dr. V. Vasudeva Rao, Professor, VR Siddhartha Engg College, Vijayawada.

- He mentioned that the industry practices now a days need professional management and skills for carrying out daily activities effectively and also to bring awareness among the students about human values, social responsibilities
- Since the biomedical engineers not only deal with the technical aspects but also they adhere to the management it is necessary to include hospital management
- To replicate the real scenarios which are dangerous in real scenarios virtual reality can be used for experimental setups.
- Most modern hand held devices and gadgets are equipped with the security feature to access into them and most security and identity authorization techniques are based on biometrics, this topic is important to include in the syllabus.

Reflections on BME Syllabus

- The subject Fundamentals of Anatomy and Physiology is put as the single subject.
- Subjects such as biostatistics and pathology and microbiology are included.
- LTI systems are included Z-transforms analysis, recursive and non-recursive systems convolutions are included.
- Signal conditioning and signal analyzer and also display and recording devices are appended to the syllabus.
- Medical physics topic on therapeutic methods, radiation interaction in tissues and organs and principle of ionizing and non-ionizing radiations are appended.
- Added Data and Pulse communication source and error control coding multi user radio communication.
- Added programming of 8051 and microprocessor interfacing.

- Subjects Biomechanics, Biomems, Biomedical signal processing and biocontrol systems are added as advanced subjects for the medical stream.
- Subject, intellectual property rights has been added as per the suggestion of Mr. K. Srikanth.
- Subjects: fiber optics and lasers in medicine (different laser techniques, photonics instrumentation and optical holography) and assist devices are added.
- According to the suggestion of Dr. Vasudeva Rao about the professional skill, subject professional ethics has been added as a compulsory subject.
- Hospital management subject is included as per the suggestion of Dr.Vasudeva Rao.
- Engineering principles underlying biometric systems, scientific foundation need to design, implement and evaluate biometric identification system are some of the topics that are included in the subject Biometric systems.
- Virtual reality subject is decided to include in the syllabus.

The following are the outcomes of the meeting:

1. Major restructuring has taken place in the curriculum with theoretical courses amalgamated with laboratory sessions and skill components added which is oriented towards minor projects, field projects, industrial related projects and modular courses.
2. The curriculum follows the choice based credit system(CBCS)
3. The proposed course structure is approved with effect from the academic year 2016-17 for the 4 years of B.Tech programme in Biomedical Engineering. The proposed syllabus is applicable for 2016 admitted batch onwards.
4. The finalized Couse Structure is provided in Appendix I.
5. The curriculum is encompassing the courses that enable employability or entrepreneurship or skill development presented in Appendix II.
6. The courses in the revised curriculum (R16) significant changes are made in the content. The percentage of revision from R13 to R16 is 39%. The list of new courses is provided in Appendix III.
7. Analysed feedback from Stakeholder's in CDMC is placed before the BoS and given utmost priority while designing the curriculum and their suggestions are implemented.

Signatures of the member's present

1. Dr. G Jeevana Latha
2. Mr. S. Kumar
3. Dr. Rama Subba Reddy

4. Mr. K. Srikanth
5. Dr. V. Vasudeva Rao
6. Dr. N. Usha Rani

APPENDIX - I

I Year I Semester

S. No	Course Name	L	T	P	Credits
1	Basic Mathematics -I	3	1	2	5
2	Engineering Physics	3	-	-	3
3	Technical English Communication	3	-	2	4
4	Basics of Computer and Internet	3	-	2	4
5	Computer Programming	3	1	2	5
6	Basics of Engineering Products	3	2	-	4
7	English Proficiency and Communication Skills	-	-	2	1
8	Engineering Physics Laboratory	-	-	3	2
	Total	18	4	15	28

I Year II Semester

S. No	Course Name	L	T	P	Credits
1	Basic Mathematics -II	3	1	2	5
2	Engineering Chemistry	3	-	-	3
3	Engineering Graphics	1	-	3	3
4	Basics of Electrical and Electronics Engineering	3	-	2	4
5	Fundamentals of Anatomy and Physiology	3	1	2	5
6	Environmental Studies and Technology	2	-	-	2
7	Data Structures	3	-	2	4
8	Engineering Chemistry Laboratory	-	-	3	2
	Total	18	2	14	28

II Year I Semester

S.No	Course Name	L	T	P	Credits
1	Biomechanics	3	-	-	3
2	Biostatistics	3	-	-	3
3	Biochemistry	3	-	2	4
4	Electronics Engineering -I	3	-	2	4
5	Network Theory	3	1	-	4
6	Signals and Systems for Bioengineers	3	-	2	4
7	Soft skills Laboratory	-	-	2	1
8	Employability and Life Skills	-	-	-	1
	Total	18	1	8	24-26

S. No	Course Name	L	T	P	Credits
1	Electronics Engineering-II	3	-	2	4
2	Biomaterials and Artificial Organs	3	-	-	3
3	Basic Clinical Science	3	-	2	4
4	Transducers and Biosensors	3	-	2	4
5	Professional Communications Lab	-	-	2	1
6	Departmental Electives	-	-	-	3-4
7	Department /Open Elective	-	-	-	3-4
8	Employability and Life Skills Elective	-	-	-	1-3
	Total	12	3	8	23-27

III Year I Semester

S.No	Course Name	L	T	P	Credits
1	Analog and Digital Communication	3	-	2	4
2	Biocontrol Systems	3	1	-	4
3	Biomedical Instruments	3	1	2	5
4	Fundamentals of Microcontrollers	3	-	2	4
5	**Department Elective -1**	-	-	-	**3-4**
6	**Department /Open Elective**	-	-	-	**3-4**
7	Employability and Life Skills Elective	-	-	-	1-3
	Total	12	2	6	24-28

III Year II Semester

S. No	Course Name	L	T	P	Credits
1	Professorial Ethics	2	-	-	2
2	Biomedical Signal Processing	3	1	2	5
3	Diagnostic and therapeutic Equipments -I	3	1	-	4
4	Medical Informatics	3	1	-	4
5	Medical Imaging Techniques	3	1	-	4
6	**Department Elective**		-	-	**3-4**
7	Department /Open Elective	-	-	-	3-4
8	Employability and Life Skills Elective	-	-	-	1-3
	Total	14	4	4	24-28

IV Year I Semester

S. No	Course Name	L	T	P	Credits
1	Diagnostic and therapeutic Equipments -II	3	-	2	4
2	Medical Imaging Processing	3	1	2	5
3	Tele Medicine	3	1	-	4
4	Managerial Science	3	-	-	4
5	Department Elective	-	-	-	3-4
6	Department /Open Elective	-	-	-	3-4
7	Employability and Life Skills Elective	-	-	-	1-3
	Total	15	-	6	25-29

IV Year II Semester

S. No	Course Name	L	T	P	Credits
1	Project work/Internship	-	-	30	15
	Total	-	-	30	15

DEPARTMENT ELECTIVE STREAMS AND COURSES

STREAM-1: BIOMEDICAL RESEARCH AND DEVELOPMENT

S. No	Department Electives	L	T	P	Credits
1	Hospital Managements				
2	Biofluids and Dynamics	3	-	-	3
3	Electromagnetic Biointeraction	3	-	-	3
4	Bioinformatics	3	-	-	3
5	Assist Devices	3	-	-	3
6	Tissue Engineering	3	-	-	3
7	Fiber Optics and Laser in Medicine	3	-	-	3
8	Rehabilitation Engineering	3	-	-	3
9	Biometric Systems	3	-	-	3
10	Intellectual Property rights	3	-	-	3

STREAM-2: ELECTRONICS AND HOSPITAL MANAGEMENT

S. No	Department Electives	L	T	P	Credits
1	Hospital Managements				
2	BioMEMS	3	-	-	3
3	VLSI Design	3	-	-	3
4	Assist Devices	3	-	-	3
5	Fiber Optics and Laser in Medicine	3	-	-	3
6	Adhoc and Sensor Networks	3	-	-	3
7	Intellectual Property rights	3	-	-	3
8	Rehabilitation Engineering	3	-	-	3

STREAM-3: IT IN HEALTHCARE

S. No	Department Electives	L	T	P	Credits
1	Hospital Managements				
2	Operating Systems	3	-	-	3
3	Computer Organization	3	-	-	3
4	Assist Devices	3	-	-	3
5	Computer Networks	3	-	-	3
6	Internet and Java Programming	3	-	-	3
7	Virtual Reality	3	-	-	3
8	Soft Computing	3	-	-	3

MEDICAL COURSES

S. No	Modular Course	L	T	P	Credits
1	Medical Physics	3	-	-	3

OPEN ELECTIVE STREAMS AND COURSES

S. No	MANAGEMENT	L	T	P	Credits
1	Principles and Practice of Management	4	-	-	4
2	Managerial Economics	4	-	-	4
3	Finance for Engineers	4	-	-	4
4	Engineering Entrepreneurship	4	-	-	4

S. No	HUMANITIES AND SCIENCES	L	T	P	Credits
1	Indian History and Culture	4	-	-	4
2	Polity and Governance of India	4	-	-	4
3	Economic and Social Development of India	4	-	-	4
4	Geography and Environmental Concerns of India	4	-	-	4

S. No	INFORMATION TECHNOLOGY	L	T	P	Credits
1	Object Orientated Programming	3	-	--	3
2	Web Technologies	3	-	-	3
3	Scripting Language	3	-	-	3
4	Database Management Systems	3	-	-	3
5	Unix Programming	3	-	-	3
6	Software Engineering	3	-	-	3
7	Data Maining Techniques	3	-	-	3
8	Multimedia Systems	3	-	-	3

*The courses that are highlighted denote implementation of 'Choice Based Credit System (CBCS)|"

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APPENDIX - II
List of courses that enable Employability/Entrepreneurship/Skill Development in the R-16

B. Tech – Biomedical Engineering

S.No	Name of the Courses	Employability/ Entrepreneurship / Skill development
1	Fundamentals of Anatomy & Physiology	Skill development
2	Biomechanics	Skill development
3	Biostatistics	Skill development
4	Electronics Engineering-I	Employability
5	Biochemistry	Employability
6	Network Theory	Employability
7	Signals and Systems for bioengineers	Employability
8	Electronics Engineering-II	Employability
9	Biomaterials and Artificial Organs	Skill development
10	Basic Clinical Science	Employability
11	Transducers and Biosensors	Employability
12	Hospital Management	Entrepreneurship
13	Biofluids and Dynamics	Skill development
14	Operating System	Employability
15	Bio MEMS	Skill development
16	Computer Organization	Skill development
17	Analog & Digital Communication	Skill development
18	Biocontrol Systems	Skill development
19	Biomedical Instrumentation	Employability
20	Fundamentals of Microcontrollers	Employability
21	Assist Devices	Skill development
22	Tissue Engineering	Skill development
23	Electromagnetic Biointeraction	Skill development
24	Bioinformatics	Skill development
25	Fiber optics and lasers in Medicine	Skill development
26	Internet and Java Programming	Skill development
27	Virtual Reality	Skill development

28	Soft computing	Employability
29	Medical Physics	Employability
30	Biomedical Signal Processing	Skill development
31	Diagnostic and Therapeutic Equipments-1	Employability
32	Medical Informatics	Skill development
33	Medical Imaging Techniques	Employability
34	Fiber Optics and Lasers in Medicine	Skill development
35	Diagnostic and Therapeutic Equipment's-II	Employability
36	Medical Image Processing	Employability
37	Telemedicine	Skill development
38	Rehabilitation Engineering	Skill development
39	Biometric Systems	Employability
40	Intellectual Property rights	Entrepreneurship
41	Internship	Employability
42	Project work	Employability

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APPENDIX - III

List of New courses in the R-16

B.Tech – Biomedical Engineering Curriculum

S.No	Courses Name
1	Fundamentals of Anatomy & Physiology
2	Biomechanics
3	Biostatistics
4	Electronics Engineering-I
5	Biochemistry
6	Network Theory
7	Signals and Systems for bioengineers
8	Electronics Engineering-II
9	Biomaterials and Artificial Organs
10	Basic Clinical Science
11	Transducers and Biosensors
12	Hospital Management
13	Biofluids and Dynamics
14	Operating System
15	Bio MEMS
16	Computer Organization
17	Analog & Digital Communication
18	Biocontrol Systems
19	Biomedical Instrumentation
20	Fundamentals of Microcontrollers
21	Assist Devices
22	Tissue Engineering
23	Electromagnetic Biointeraction
24	Bioinformatics
25	Fiber optics and lasers in Medicine
26	Internet and Java Programming
27	Virtual Reality
28	Soft computing
29	Medical Physics
30	Biomedical Signal Processing
31	Diagnostic and Therapeutic Equipments-1
32	Medical Informatics

33	Medical Imaging Techniques	
34	Diagnostic and Therapeutic Equipment's-II	
35	Medical Image Processing	
36	Telemedicine	
37	Rehabilitation Engineering	
38	Biometric systems	
39	Intellectual Property rights	
40	Internship	
41	Project work	

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