VIGNAN'S
Foundation for Science, Technology & Research
(Deemed to be University)
Estd. u/s 3 of UGC Act 1956

DEPARTMENT OF BIOMEDICAL ENGINEERING

Date: 06.04.2024

Minutes of Board of Studies Meeting

Board of Studies (BoS) meeting of B.Tech.,Biomedical Engineering (BME) programme was conducted on 06.04.2024 in virtual meeting mean link : https://us06web.zoom.us/j/84215567317?pwd=aRfVO9AJigb2jm3Lbx1HY5KhlolbJg.1

Agenda of the BoS Meeting:

1. To Discuss and finalize the curriculum structure (C24) and detailed syllabus of B.Tech., Biomedical Engineering (BME) Programme for the regulation 2022.
2. To approve the (C24) R22 curriculum and syllabus of B.Tech., Biomedical Engineering Programme and recommend to the Academic council.
3. Discussion of results-FA, SA, Grades, Correlations AY 2022-23, Best practices of Formative assessment and T&P activities.
4. Approval/ Ratifications of NPTEL courses, Honor/minor/department elective/open elective courses.
5. Analysis of the feedback collected from various stakeholders such as Alumni, Employers, Faculty, Parents and Students during the academic year 2022-23.
6. Any other points with the permission of Chairperson.

The following members were present either thorough offline or online.

S.No.	Name and designation of the Member	Position	Signature
1.	Dr. Dr. Sitaramanjaneya Reddy, Professor and HoD, Dept.of BME, VFSTR.	Chairperson	
2.	Dr. M. Ramasubba Reddy, Prof, Applied Engineering. IIT Madras.	External Member (Academic)	online
3.	Dr. M. Malini, Professor & HoD, Osmania University, Dept.of Biomedical Engineering, Hyderabad.	External Member (Academic)	online
4.	Mr. Renjith C.V, Electrical Architect, Digital lead at Philips India Ltd., Pune/Bangalore.	External Member (Industry) (Invitee)	online
5.	Dr. Amarnath, M.B.B.S, M.S, Orthopedic Surgeon, Amarnath Orthopaedics hospital, Guntur.	External Member (Invitee)	online

6.	Dr. N.Usha Rani, Professor &Dean SEECE, VFSTR	Internal Member
7.	Dr. Amit Kumar Singh, Assistant Professor, Dept.of BME, VFSTR.	Internal Member
8.	Dr. Amar Nath Sah, Assistant Professor, Dept.of BME VFSTR.	Internal Member
9.	Ms. Hima Bindu, Assistant Professor, Dept.of BME, VFSTR.	Internal Member
10.	Dr. P. Sambaiah, Associate Professor, Dept.of ECE, VFSTR.	Nominee (Dean-R&D)
11.	Ms. Prathiba Jonnala, Assistant Professor, Dept.of BME, VFSTR.	Nominee (Dean-SEECE)
12.	Ms. Hima Harshan P, Assistant Professor, Dept.of BME, VFSTR.	Member Secretary

Chairperson Dr. Sitaramanjaneya Reddy, Professor and Head, Biomedical Engineering (BME) department, VFSTR opened the meeting by welcoming and introducing the external members, invitees to the internal members. Chairperson presented about the C24 curriculum for Biomedical Engineering which emphasis on creating *learning centric* (continuous learning and continuous assessment model), offering B.Tech.

The following points were discussed in the BoS meeting:

1. The curriculum structure (C24) and detailed syllabus of B.Tech., Biomedical Engineering (BME) Programme for the regulation 2022.
2. Describe the Curriculum structure with credits, credits distribution.
3. Revision of R22 curriculum to C24, following changes shall be noted.
   (a) Physics, Chemistry, Mathematics I and II will be common to all first-year students
   (b) Basic sciences require 30 credits
   (c) The following courses are mandatory :
   Indian knowledge system
   Professional Ethics-Biomedical Ethics (Department module)
   Design Thinking an orientation

4. C24 curriculum will carry 160 credits instead of 161 credits in R22.
5. Departmental Elective II & III is mandatory courses for biomedical students.
6. Two open electives from VFSTR and one from the NPTEL course are required.
7. Major reformation has taken place in the curriculum by offering Honours/Specialization degree or Minor degree thorough 20 more credits with additional courses.
8. The Biomedical Engineering Department offers on-site training, which involves students visiting industries or hospitals for a month to get exposure..
9. The courses listed in Appendix II that promote entrepreneurship, employability, or skill development are included in the curriculum.
10. The significant changes are made in the content of all courses and hence the courses are considered as new courses provided in Appendix- III.
11. The overall average percentage of the modified syllabus was 30.17% as compared to the prior curriculum.
12. Electives and streams/pools.
13. Minor / Honor courses.
14. A discussion over the necessity and curriculum of a course on design thinking.
15. Discussion regarding the training on the professional ethics course.

1. Dr. M. Rama Subba Reddy, Dept. of Applied Engineering, IIT Madras

- Specialization can be added in minor course, if they can do the minors take from biomedical department, it will be good than taking as honors. One particular area with specialization such as Quality and reliability, Embedded & IoT, Signal & Image processing and Regulatory Biomedical Engineering etc.
- Suggested to include application of basic physiological signals in relevant units.
- Recommended and suggested that each module incorporate applications in addition to emphasizing the fundamental knowledge covered in core biomedical engineering courses.
- The BME program's open elective course syllabus is a condensed version of the core BME syllabus for core disciplines.
- Recommended that advanced medical courses with real-world applications, like those on the Internet of Things, virtual and augmented reality, robotics and automation in medicine, and AI-related computer approaches, be offered as department electives.

2. Dr. M. Malini, Dept. of Biomedical Engineering, Osmania University.

- Recommended to consider Advanced Mathematics (Maths-3) for improve the engineering skills to students also useful to GATE examination..
- Suggested an onsite training program for II and III BME students to gain practical experience.
- Recommended to continue the Medical instrumentation as a minor course.
- Honors courses should focus on the advanced and in-depth biomedical engineering courses.
- Recommended to Incorporate courses on point-of-care devices, medical equipment maintenance and troubleshooting, and virtual and augmented reality into department electives to simulate real-world scenarios. BME is a highly interdisciplinary field that requires these skills.
- Most modern handheld devices contain security features, and most security and identity authentication solutions rely on communication. It is suggested that embedded and IoT be included in the course as department electives..
- Each module should cover both fundamental understanding of biomedical subjects and their applications..
- I believe it is critical to adding Medical Equipment Maintenance and Troubleshooting or service oriented courses, and I propose that one or two courses be added as department electives.
- I am very much appreciating the rationale for incorporating interdisciplinary courses into the BME stream, I suggest to include applications in the medical field.
- Medical applications for DS, Python programming, and soft computing should be explored.
- To replicate real-world scenarios of connecting medical devices in virtual mode, which can be used for experimental setups, include virtual instrumentation courses.
- Reduce classroom instruction and increase students' hands-on experience with medical equipment.

3. Mr. Renjith C.V, Electrical Architect Digital lead at Philips India Ltd., Pune/Bangalore.

- Advised to incorporate amplifier selection criteria into Analogue Electronics Circuits.
- Suggested to include the topics ADC, DAC, voltage regulators, PLD and FPGA in Analog and Digital ICs
- Suggested to include the topics biomedical instrumentation in OLED/LED displays.
- Advised to include pulse oximeters and patient monitors in Biomedical Instrumentation.
- Recommended to include clinical chemistry analysers, DNS sequencers, Microscope in Biomedical Instrumentation
- Suggested to include radiation emission measurement tests using spectrum analyzers in Analog and Digital Communication.
- Recommended practices for microprocessors and microcontrollers include RM 9, CORTEX M architecture, and data reading via I2C and SPIs.
- Recommended to include in IEC60601, EMI/EMC in Diagnostic and Therapeutic equipments.
- Recommended to include DSP architectures-TMS320 C55X and Blackfin architecture in Biomedical Signal Processing
- Recommended to include introduction to image acquisition. (X-ray, CT, MRI etc), X ray detectors, CT detectors and beam forming, X ray, CT and MRI image reconstruction PET, SPECT and PET-MR systems in Medical Imaging Modalities.
- Recommended to include Sensor signal conditioning and interface in Biosensors and Transducers.
- Recommended to include ISO 13845, radiation and safety standards in Hospital Management.
- Suggested to include IoT protocols, communication technologies, IoT security, IoT implementation etc in Embedded System and IoT in Health Care.
- Suggested to include introduction to GPU architecture and Programming (nptelLink) CT, MR reconstruction techniques and ultrasound beam foaming, introduction to camera architectures, image sensors etc in Machine Vision in Medical Technology.
- Recommended to include Introduction to ASIC and SoC in VLSI for bioengineers.
- Recommended to include microscopy, DNA sequences in Clinical Instrumentation

- Suggested to include Design thinking: System engineering and system concepts to be included in design thinking. Electrical/ mechanical/ Software: System engineering/ Design thinking/ System concepts
- Design Thinking & Engineering Orientation: Emphasizes design thinking and engineering ideas, including electrical, mechanical, and software systems.
- The medical industry has R&D centers and regulatory bodies. Can take students on industrial trips such as Sameer, Tauli, UL, and SGS. I gained experience in the areas of quality and regulation.
- Collaborations with other Departments: Reliability Engineering, Embedded Systems&IoT, Design Hardware, AI, Robotic, Digital Signal Processing, FPGA design, System on Chip.
- Additional courses include software design and user interface, digital imaging system specializations, reliability engineering, testing and quality assurance, and quality and regulatory courses.
- Encourage students to select NPTEL courses related to image processing hardware design courses (GPU Architect), apart from curriculum (related to Minor, IDP & Field projects)
- To get a better knowledge of the work of a biomedical engineer, an on-site short-term training program, ideally at a hospital, is recommended before beginning an internship.

4. **Suggestions from internal members**

- Recommended to introduce Recommended and suggested to introduce (Mathematics -III) named as Advanced Mathematics in II year I semester and Biostatics and probability in the II year II semester. The content in the syllabus is similar to GATE–BME or IIT syllabus, which will be useful for studies to better understanding the engineering concepts, increase competence among the students and preparation for competitive examinations.
- Suggested adding AICET's required Professional Ethics course to the curriculum. The first module's material should be common to all circuit branches, while the second module will be limited to biomedical engineering students.
- Have a discussion on the contents to be included for Design thinking and orientation course. It was suggested that a course curriculum be designed for system design and engineering.
- Use up-to-date textbooks and reference books.
- Define skills and activities for each course.

- Correlate lab practices and experiments within each course.

The above recommendations and comments emerged during the development of the C24 BME course content. Changes are made in accordance with the suggestions. Modifications are approved by the external BoS members via e-mail correspondence and then presented to the academic council with the agreement of the BoS chair.

The following resolutions made after the discussion:

1. BoS members approved the revised C24 curriculum structure, syllabus for the B.Tech., Biomedical Engineering programme, which aligns with the NEP 2020. Curriculum structure is provided in Appendix-I.
2. A minor restructuring has taken place in the C24 curriculum which is oriented towards continuous learning and assessment based on module structure.
3. The curriculum has been reformed to include "P" practice-based courses on cutting-edge themes and technology, allowing for Honours/Specialization or Minor degree options with 20 additional credits.
4. The curriculum has been restructured to focus on practice-based learning in laboratories. Students can earn an honors/specialization degree or minor degree with 20 additional credits. The curriculum also includes COMSOL multi-physics simulation software and fabrication-oriented interdisciplinary, field, and industrial projects..
5. The curriculum is encompassing the courses that enable employability or entrepreneurship or skill development, provided in Appendix- II.
6. The significant changes are made in the content of all courses and as suggested by external and internal members hence the courses are considered as new courses listed in Appendix- III.
7. The average proportion of syllabus revisions was 32% compared to the prior curriculum.

Based on the feedback from various stakeholders and suggestions given by the members, the Chairperson of BoS stated that those fruitful suggestions would be incorporated appropriately in the C24 curriculum and syllabi of the regulation R22 and this will be recommended to the Academic Council of VFSTR for the approval. There being no further points for discussion, the Chairperson thanks all the external, internal, invited members and announced that the meeting was adjourned.

Member Secretary **Chairperson**

VIGNAN'S
(Deemed to be University)

DEPARTMENT OF BIOMEDICAL ENGINEERING

APPENDIX I

Biomedical Engineering (BME) Programme: Curriculum Structure

I Year I Semester Structure

S.No	Course Title	L	T	P	C	Course Category
1.	Elementary Mathematics	3	2	0	4	Basic Science
2.	Physics	2	0	2	4	Basic Science
3.	Engineering Graphics	2	0	2	3	Basic Engineering
4.	IT Tools & Cyber security	0	0	4	2	Basic Engineering
5.	Programming in C	2	0	2	3	Basic Engineering
6.	English Proficiency & Communication Skills	0	0	2	1	Humanities
7.	Environmental Studies	2	2	-	3	Basic Sciences
	Total	11	4	12	20	
		27 Hrs			20	

S.No	Course Title	L	T	P	C	Course Category
1	Orientation Session-1	0	2	0	1	Binary Grade
2	Constitution of India	2	0	0	1	Binary Grade
3	Physical fitness	0	0	2	1	Binary Grade

I Year II Semester Structure

S.No	Course Title	L	T	P	C	Course Category
1	Matrices and Differential Equations	3	2	0	4	Basic Science
2	Chemistry	2	2	2	4	Basic Engineering
3	Basic of Electrical & Electronics Engineering	2	0	2	2	Basic Engineering
4	Competitive coding	0	2	4	3	Basic Engineering
5	Technical Communication English	2	0	2	3	Humanities
6	Management Studies	2	2	0	3	Humanities
	Total	11	8	10	20	
		29 Hrs			**20**	

S.No	Course Title	L	T	P	C	Course Category
1	Orientation Session -2	0	2	0	1	Binary Grade
2	Universal Human Values	2	0	0	1	Binary Grade
3	Indian Knowledge Systems – Dept. specific	0	0	2	1	Binary Grade

II Year I Semester Structure

S.No	Course Title	L	T	P	C	Course Category
1	Advanced Mathematics	3	4	0	4	Basic Science
2	Data Structures and Algorithms	2	2	2	4	Basic Engineering
3	Clinical Biochemistry	2	-	2	3	Basic Sciences
4	Analog Electronic Circuits	2	2	2	4	Professional core
5	Electrical Circuit Theory	2	2	-	3	Professional core
6	Fundamentals of Anatomy and Physiology	2	-	2	3	Professional core
7	Basic Clinical Science	2	2		3	Professional core
8	Design Thinking & Engineering Orientation	-	-	2	1	Basic Engineering
	Total	15	10	10		
		35 Hrs			25	

II Year II Semester Structure

S.No	Course Title	L	T	P	C	Course Category
1	Biostatistics	3	0	2	4	Basic Science
2	Practicing Data Structures	-	-	2	1	Basic Engineering
3	Biomedical Signals and Systems	2	2	2	4	Professional core
4	Analog and Digital ICs	2	2	2	4	Professional core
5	Biomedical Instrumentation	2	2	2	4	Professional core
6	Open Elective – 1(NPTEL)	3	-	-	3	Open Elective
7	Field projects / IDP	-	-	2	1	Project
	Total	12	8	10	21	
	Minor / Honors – 1	3	0	2	4	
	Total	15	8	12	25	
		35 Hrs.				

III Year I Semester Structure

S.No	Course Title	L	T	P	C	Course Category
1	Soft Skills Lab	-	-	2	1	Humanities
2	Analog and Digital Communication	2	-	2	3	Professional core
3	Microprocessors and Microcontrollers	2	2	2	4	Professional core
4	Diagnostic and therapeutic Equipments	2	2	2	4	Professional core
5	Department Elective – 1	2	2	-	3	Department Elective
6	On-site training	-	-	2	2	Professional core
7	Open Elective – 2	2	2		3	Open Elective
8	BEC Certification	-	-	-	1	Humanities
	Total	10	8	10	21	
	Minor / Honors – 2	3	0	2	4	
	Total	13	8	12	25	
		33 Hrs.				

III Year II Semester Structure

S.No	Course Title	L	T	P	C	Course Category
1	Quantitative aptitude & Logical reasoning	1	2	-	2	Humanities
2	Biomedical signal processing	2	2	2	4	Professional core
3	Medical Imaging Modalities	2	2	-	3	Professional core
4	Department Elective – 3	2	2	-	3	Department Elective
5	Department Elective –4	2	2	2	4	Department Elective
6	Open Elective – 3	3			3	Open Elective
7	Field projects / IDP	-	-	2	1	Project
8	Industry interface course (Modular course)	1			1	Department Elective
	Total	13	10	6	21	
	Minor / Honors – 3	3	0	2	4	
	Total	16	10	8	25	
		34 Hrs.				

IV Year I Semester Structure

S.No	Course Title	L	T	P	C	Course Category
1	Medical Image Processing	2	2	2	4	Professional core
2	Biomechanics	2	1	2	3	Professional core
3	Department Elective – 5	2	2	-	3	Department Elective
4	Department Elective – 6	2	2	-	4	Department Elective
5	Department Elective – 7	2	2	2	4	Department Elective
6	Professional Ethics and values	2	-	-	2	Humanities
	Total	12	9	6	20	
	Minor / Honors – 4	3	0	2	4	
	Total	15	9	8	24	
		32 Hrs.				

IV Year II Semester Structure

S.No	Course Title	L	T	P	C	Course Category
1	Internship / Project Work	**0**	**2**	**22**	**12**	Project
	Total	**24**			**12**	
	Minor / Honours – 5 (for project)	0	2	6	4	Theory course may be also offered
	Total	32 Hrs.			16	

L=Lecture; T= Tutorial; P= Practical; C=Credits

List of Department Elective

S.No	Course Title	L	T	P	C
1	Hospital Management	2	2	0	3
2	Medical Informatics	2	2	0	3
3	Assist devices and Implant Technology	2	2	2	4
4	Biomaterials and artificial organs	2	2	0	3
5	Biosensors and Transducers	2	2	2	4
6	Physiological Control Systems	2	2	0	3
7	Biofluids and Dynamics	2	2	2	4
8	Embedded system and IoT in health care	2	2	2	4
9	Rehabilitation Engineering	2	2	0	3
10	Fiber Optics and Lasers in Medicine	2	2	2	4
11	Telemedicine	2	2	0	3
12	Soft computing techniques	2	2	2	4
13	Medical Physics	2	2	0	3
14	Medical Equipment Maintenance and Troubleshooting	2	0	2	3
15	Robotics and Automation in Medicine	2	2	2	4
16	Machine Vision in Medical Technology	2	0	2	3
17	Virtual Bio-Instrumentation	2	2	2	4
18	Point of Care Technology and Clinical Applications	2	0	2	3
19	Virtual Reality	2	2	0	3
20	VLSI for bioengineers	2	0	2	3

List of Open Elective Courses

S.No	Course Title	L	T	P	C
1	Basic Clinical Sciences	2	2	0	3
2	Biomedical Instrumentation	2	0	2	3
3	Diagnostic and Therapeutic Equipments	2	0	2	3
4	Medical Imaging Modalities	2	2	0	3
5	Biomaterials	2	0	2	3
6	Biomechanics	2	0	2	3

List of NPTEL Courses

S.No	Course Title	Weeks	C
1	Neuroscience of Human Movements	12	3
2	Electronic modules for industrial applications using Op AMP	12	3
3	Computational Neuroscience	12	3
4	Pattern Recognition And Application	12	3
5	Real-Time Digital Signal Processing	12	3
6	Artificial Intelligence : Search Methods For Problem Solving	12	3
7	Transducers for Instrumentation	12	3
8	Electronic systems for cancer Diagnosis	12	3
9	Deep Learning for Computer Vision	12	3
10	Enclosure Design of Electronics Equipment	12	3
11	Medical Image Analysis	12	3
12	Deep Learning For Visual Computing	12	3
13	Advanced Neural Science for Engineers	12	3
14	Embedded System Design	12	3
15	Computer Vision and Image Processing - Fundamentals and Applications	12	3
16	Biophotonics	12	3

List of Honour/Specialization Courses

S.No	Course Title	L	T	P	C
1	Assist devices and Implant Technology	3	0	2	4
2	Biofluids and Dynamics	3	2	0	4
3	Machine Vision in Medical Technology	3	0	2	4
4	Soft Computing Techniques	3	2	0	4
5	Medical Physics	3	2	0	4
6	Robotics and Automation in Medicine	3	0	2	4
7	Virtual Reality	3	0	2	4

List of Minor Courses

Minor - Medical Instrumentation

S.No	Course Title	L	T	P	C
1	Clinical Instrumentation	3	2	0	4
2	Diagnostic and Therapeutic Equipments	3	0	2	4
3	Biomedical Signal Processing	3	0	2	4
4	Medical Imaging Modalities	3	2	0	4
5	Medical Image Processing	3	0	2	4
6	Project work	0	2	6	4

Chairperson

VIGNAN'S
Foundation for Science, Technology & Research
(Deemed to be University)
Estd. u/s 3 of UGC Act 1956

DEPARTMENT OF BIOMEDICAL ENGINEERING

APPENDIX II

List of Courses that Enables Employability or Entrepreneurship or Skill Development

S. No.	Year and Semester	Course Title	Employability / Entrepreneurship / Skill development
1.	I Year I Semester	Elementary Mathematics	Skill development
2.	I Year I Semester	Physics	Skill development
3.	I Year I Semester	Engineering Graphics	Skill Development
4.	I Year I Semester	IT Tools & Cyber security	Skill development
5.	I Year I Semester	Programming in C	Skill development
6.	I Year I Semester	English Proficiency & Communication Skills	Skill development
7.	I Year I Semester	Environmental Studies	Skill development
8.	I Year II Semester	Matrices and Differential Equations	Skill development
9.	I Year II Semester	Chemistry	Skill development
10.	I Year II Semester	Basic of Electrical & Electronics Engineering	Skill development
11.	I Year II Semester	Competitive coding	Skill development
12.	I Year II Semester	Technical Communication English	Skill development
13.	I Year II Semester	Management Studies	Skill development
14.	II Year I Semester	Advanced Mathematics	Skill development
15.	II Year I Semester	Data Structures and Algorithms	Employability
16.	II Year I Semester	Clinical Biochemistry	Employability
17.	II Year I Semester	Analog Electronic Circuits	Skill development
18.	II Year I Semester	Electrical Circuit Theory	Skill development
19.	II Year I Semester	Fundamentals of Anatomy and Physiology	Skill development
20.	II Year I Semester	Basic Clinical Science	Employability
21.	II Year I Semester	Design Thinking & Engineering Orientation	Skill development
22.	II Year II Semester	Biostatistics and probability	Skill development

23.	II Year II Semester	Practicing Data Structures	Employability
24.	II Year II Semester	Biomedical Signals and Systems	Skill development
25.	II Year II Semester	Analog and Digital ICs	Skill development
26.	II Year II Semester	Biomedical Instrumentation	Employability
27.	II Year II Semester	Field projects / IDP	Employability
28.	III Year I Semester	Soft Skills Lab	Entrepreneurship
29.	III Year I Semester	Analog and Digital Communication	Skill development
30.	III Year I Semester	Microprocessors and Microcontrollers	Entrepreneurship
31.	III Year I Semester	Diagnostic and therapeutic Equipments	Skill development
32.	III Year I Semester	On-site training	Employability
33.	III Year II Semester	Quantitative aptitude & Logical reasoning	Employability
34.	III Year II Semester	Biomedical signal processing	Employability
35.	III Year II Semester	Medical Imaging Modalities	Employability
36.	III Year II Semester	Field projects / IDP	Skill development
37.	III Year II Semester	Industry interface course (Modular course)	Skill development
38.	IV Year I Semester	Medical Image Processing	Employability
39.	IV Year I Semester	Biomechanics	Entrepreneurship
Department Electives			
40.		Hospital Management	Employability
41.		Electrical Circuit Theory	Skill development
42.		Medical Informatics	Employability
43.		Assist devices and Implant Technology	Employability
44.		Biomaterials and artificial organs	Employability
45.		Biosensors and Transducers	Employability
46.		Physiological Control Systems	Skill development
47.		Biofluids and Dynamics	Employability
48.		Embedded system and IoT in health care	Employability
49.		Rehabilitation Engineering	Employability
50.		Fiber Optics and Lasers in Medicine	Employability
51.		Telemedicine	Skill development
52.		Soft computing techniques	Employability
53.		Medical Physics	Employability

54.		Medical Equipment Maintenance and Troubleshooting	Employability
55.		Robotics and Automation in Medicine	Employability
56.		Machine Vision in Medical Technology	Skill development
57.		Virtual Bio-Instrumentation	Employability
58.		Point of care Technology and Clinical Applications	Employability
59.		Virtual Reality	Employability
60.		VLSI for bioengineers	Employability
Honours Courses			
61.		Assist devices and Implant Technology	Employability
62.		Biofluids and Dynamics	Employability
63.		Machine Vision in Medical Technology	Skill Development
64.		Soft Computing Techniques	Skill Development
65.		Medical Physics	Skill Development
66.		Robotics and Automation in Medicine	Employability
67.		Virtual Reality	Employability
Minor-Medical Instrumentation			
68.		Clinical Instrumentation	Employability
69.		Diagnostic and Therapeutic Equipments	Entrepreneurship
70.		Biomedical Signal Processing	Employability
71.		Medical Imaging Modalities	Employability
72.		Medical Image Processing	Employability
Open Elective Courses			
73.		Basic Clinical Sciences	Skill Development
74.		Biomedical Instrumentation	Employability
75.		Diagnostic and Therapeutic Equipments	Entrepreneurship
76.		Medical Imaging Modalities	Employability
77.		Biomaterials	Employability
78.		Biomechanics	Entrepreneurship

Chairperson

VIGNAN'S
Foundation for Science, Technology & Research
(Deemed to be University)
Estd. u/s 3 of UGC Act 1956

DEPARTMENT OF BIOMEDICAL ENGINEERING

APPENDIX III

List of New Courses in the C24 Curriculum

S. No.	Year and Semester	Course Title	Employability / Entrepreneurship / Skill development
1	I Year I Semester	Mathematics – III	Skill development
2	II Year I Semester	Design thinking & Engineering Orientation	Skill development
3	Department Elective	Point of Care Technology and Clinical Application	Employability
4	IV Year I Semester	Professional Ethics	Skill Development

Chairperson

VIGNAN'S
Foundation for Science, Technology & Research
(Deemed to be University)
Estd. u/s 3 of UGC Act 1956

DEPARTMENT OF BIOMEDICAL ENGINEERING

APPENDIX IV

Comparison of Course Contents between R22 regulation C22 and C24 Curriculums

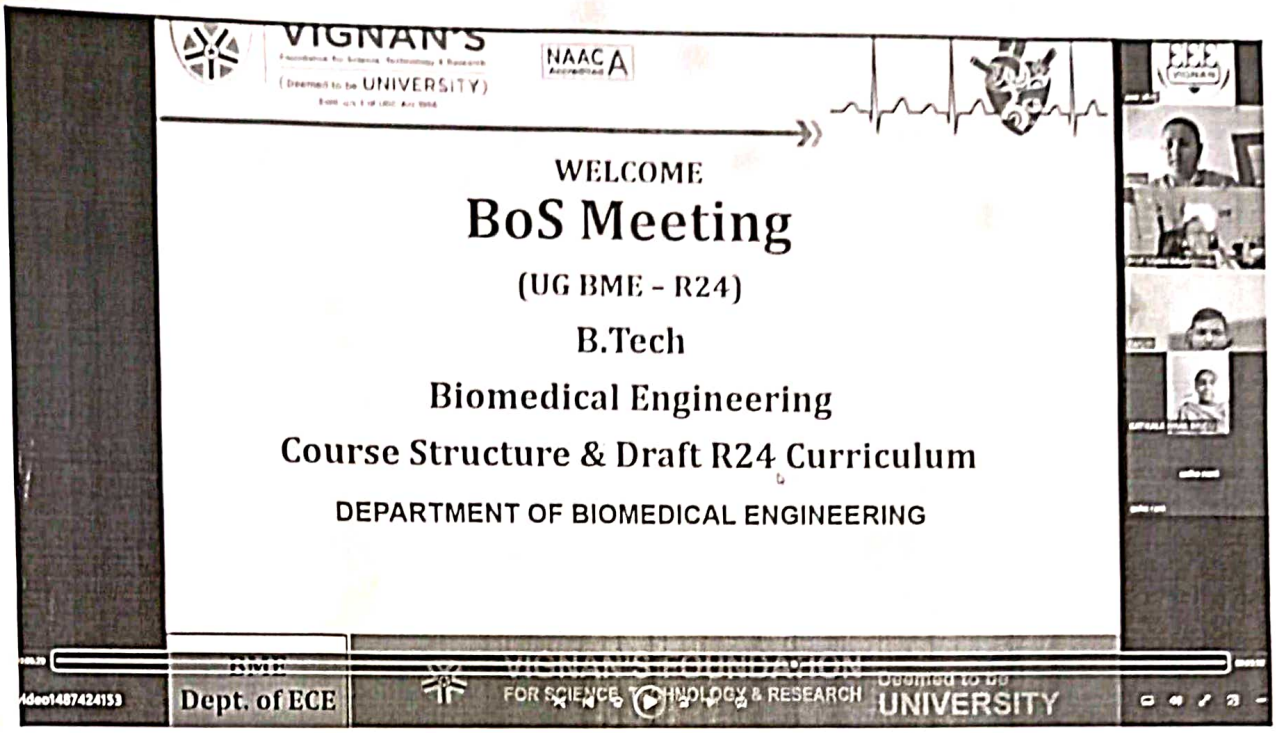
(Should be maintained by BoS member for future reference)

S. No.	Year and Semester	Course Title	% of Changes
1.	I Year I Semester	Elementary Mathematics	20
2.	I Year I Semester	Physics	20
3.	I Year I Semester	Engineering Graphics	25
4.	I Year I Semester	IT Tools & Cyber security	40
5.	I Year I Semester	Programming in C	10
6.	I Year I Semester	English Proficiency & Communication Skills	10
7.	I Year I Semester	Environmental Studies	40
8.	I Year II Semester	Matrices and Differential Equations	20
9.	I Year II Semester	Chemistry	100
10.	I Year II Semester	Basic of Electrical & Electronics Engineering	20
11.	I Year II Semester	Competitive coding	10
12.	I Year II Semester	Technical Communication English	20
13.	I Year II Semester	Management Studies	100
14.	II Year I Semester	Advanced Mathematics	100
15.	II Year I Semester	Data Structures and Algorithms	20
16.	II Year I Semester	Clinical Biochemistry	10
17.	II Year I Semester	Analog Electronic Circuits	20
18.	II Year I Semester	Electrical Circuit Theory	20
19.	II Year I Semester	Fundamentals of Anatomy and Physiology	20
20.	II Year I Semester	Basic Clinical Science	10
21.	II Year I Semester	Design Thinking & Engineering Orientation	100
22.	II Year II Semester	Biostatistics and probability	30
23.	II Year II Semester	Practicing Data Structures	10

24.	II Year II Semester	Biomedical Signals and Systems	20
25.	II Year II Semester	Analog and Digital ICs	20
26.	II Year II Semester	Biomedical Instrumentation	20
27.	II Year II Semester	Field projects / IDP	100
28.	III Year I Semester	Soft Skills Lab	10
29.	III Year I Semester	Analog and Digital Communication	20
30.	III Year I Semester	Microprocessors and Microcontrollers	20
31.	III Year I Semester	Diagnostic and therapeutic Equipments	20
32.	III Year II Semester	Quantitative aptitude & Logical reasoning	20
33.	III Year II Semester	Biomedical signal processing	25
34.	III Year II Semester	Medical Imaging Modalities	25
35.	III Year II Semester	Field projects / IDP	30
36.	III Year II Semester	Industry interface course (Modular course)	100
37.	IV Year I Semester	Medical Image Processing	20
38.	IV Year I Semester	Biomechanics	10
39.	IV Year I Semester	Professional Ethics and values	100
40.		Hospital Management	20
41.		Medical Informatics	20
42.		Assist devices and Implant Technology	15
43.		Biomaterials and artificial organs	15
44.		Biosensors and Transducers	15
45.		Physiological Control Systems	15
46.		Biofluids and Dynamics	15
47.		Embedded system and IoT in health care	20
48.		Rehabilitation Engineering	20
49.		Fiber Optics and Lasers in Medicine	10
50.		Telemedicine	20
51.		Soft computing techniques	20
52.		Medical Physics	20
53.		Medical Equipment Maintenance and Troubleshooting	20
54.		Robotics and Automation in Medicine	20

55.		Machine Vision in Medical Technology	20
56.		Virtual Bio-Instrumentation	20
57.		Point of Care Technology and Clinical Applications	100
58.		Virtual Reality	10
59.		VLSI for bioengineers	10
		Average % of Changes	30.17%

Chairperson


VIGNAN'S
(Deemed to be UNIVERSITY)
NAAC A
WELCOME
BoS Meeting
(UG BME - R24)
B.Tech
Biomedical Engineering
Course Structure & Draft R24 Curriculum
DEPARTMENT OF BIOMEDICAL ENGINEERING
BME
Dept. of ECE
VIGNAN'S FOUNDATION
FOR SCIENCE, TECHNOLOGY & RESEARCH
Deemed to be
UNIVERSITY