Minutes of the Meeting

BOARD OF STUDIES (BOS)

Department of Chemistry

Date: 4 December, 2021

Venue: Director Office/Online, FOE, TMU

Faculty of Engineering

Teerthanker Mahaveer University

Moradabad

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Teerthanker Mahaveer University

Faculty of Engineering

Department of Chemistry

Minutes of Meeting

A meeting of Board of Studies has been held in Director's office, Faculty of Engineering on 04/12/2021. Following points have been discussed regarding revision in syllabus and course matrix of existing B.Sc. (H)& M.Sc. Chemistry program for batch 2021-22. Following members were present in meeting:

1. Prof R K Dwivedi,
2. Dr M.G H Zaidi (External Expert)
3. Dr ArunSethi (External Expert)
4. DrVarun Kr Singh
5. Dr K A Gupta
6. Dr Navneet Kumar
7. Dr A D Tripathi
8. Dr Gajendra Kumar
9. Dr M K Chini

The following points were discussed in BoS:

(A) **Changes required in M.Sc. Chemistry**

1. **Regarding the optimization of Credits:**BOS recommended for reducing the total credit from 100 to 88 in M.Sc. Chemistry. The following changes will be brought to achieve the Credit 90.

   Removal of one course from the programme i.e. MCH215 (Industrial Chemistry)&reduce the credit of MCH392 (Industrial Training & Presentation) from 05 credit to 03 credit& MCH492 (Project) from 08 credit to 04 creditfor 2021-22 batch Even Semester. (***Annexure -I***)

2. BOS recommended for converting the nature of mandatory non-credit value added course to optional courses in M.Sc. Chemistry so that student may choose these course according to their ease. The courses are: TMUPA-101 (Elementary Arithmetic & Analytical Reasoning) & TMUPS-101(Managing Self) from Ist Semester. Similarly TMUPA-201(Progressive Algebra & Data Management) and TMUPS-201(Managing Work & others) for 2021-22 batch Even Semester. (***Annexure -I***)

(B) **Changes required in B.Sc (H) Chemistry:** BOS recommended for reducing the total credit from 150 to 144 in B.Sc. (H) Chemistry programme. The following changes will be brought to achieve the Credit 144.

3. Out of four course of English Communication two courses may be taught in first year for the better communication & understanding of the subject. Rest of two courses of 06 credits running in second year may be introduced as value added certificate course. This will help to reduce the number of credits as well as the overburden of the students. Following Change are required:Removal of two course from IInd year i.e. TMUGE301 (English Communication III) and TMUGE401 (English Communication IV) from 2021-22 batch onwards from regular credits. (***Annexure-II***)
4. Two course of Aptitude (TMUGA-302 Modern Algebra & Data Management, TMUGA-402 Advance Algebra & Geometry) may be abolished from B.Sc.(H) IInd year for comfortable learning. This will help the department to identify & introduce the value added courses related to core discipline from 2021-22 batch onwards. (***Annexure-II***)
5. Correction of typographical error in the two course code of B.Sc. (H) Chemistry namely **Thermal Physics & Introduction to Probability** for Academic year 2019-20 onwards.

S.NO	Course Name	Old Code	New Code
1	Thermal Physics	BAS418	BAS435
2	Introduction to Probability	BAS435	BAS418

6. Prof Arun Sethi has recommended forintroducing one interdisciplinary course in every semester in M.Sc. Chemistry Programme. Interdisciplinary courses are already part of our existing M.Sc. Chemistry programme so no change is required in this aspect.
7. BOS recommended to add the GP marks in each semester of B.Sc. (H) Chemistry & M.Sc Chemistry from 2019-20 onwards.

Meeting ended with the vote of thanks.

Annexure -I

Study&EvaluationScheme

B.Sc.(H)(Chemistry)-SemesterI

S. No	Category	CourseCode	Course	Periods			Credit	EvaluationScheme		
				L	T	P		Internal	External	Total
1	CC-1	BAS111	InorganicChemistry-I	4	-	-	4	40	60	100
2	CC-2	BAS112	PhysicalChemistry-I	4	-	-	4	40	60	100
3	AECC-1	TMUGE101	EnglishCommunication-I	2	-	2	3	40	60	100
4	GEC-1		Generic Elective Course(Theory) GenericElective-I	4	-	-	4	40	60	100
5	GEC-1		Generic Elective Course(Lab) GenericElective-I	-	-	4	2	50	50	100
6	SEC-1	BAS167	ComputerSkillsforChemist(Lab)	-	-	2	1	50	50	100
7	LC-1	BAS164	InorganicChemistry-I(Lab)	-	-	4	2	50	50	100
8	LC-2	BAS165	PhysicalChemistry-I(Lab)	-	-	4	2	50	50	100
9	DGP-1	BGP111	Discipline &GeneralProficiency	-	-	-	-	100	-	100
			Total	**14**	**-**	**16**	**22**	**360**	**440**	**800**

BridgeCourse:

1		BAS113	ElementaryMathematics	3	-	-	-	-	-	100

B.Sc.(H)(Chemistry)-Semester2

S. No	Category	CourseCode	Course	Periods			Credit	EvaluationScheme		
				L	T	P		Internal	External	Total
1	CC-3	BAS211	OrganicChemistry-I	4	-	-	4	40	60	100
2	CC-4	BAS212	PhysicalChemistry-II	4	-	-	4	40	60	100
3	AECC-2	TMUGE201	EnglishCommunication-II	2	-	2	3	40	60	100
4	GEC-2		Generic Elective Course(Theory) — Generic Elective-II	4	-	-	4	40	60	100
5	GEC-2		Generic Elective Course(Lab) — Generic Elective-II	-	-	4	2	50	50	100
6	MC-1	TMU201	EnvironmentalStudies	2	1	-	3	40	60	100
7	LC-3	BAS264	OrganicChemistry-I(Lab)	-	-	4	2	50	50	100
8	LC-4	BAS265	PhysicalChemistry-II(Lab)	-	-	4	2	50	50	100
9	DGP-2	BGP211	Discipline&GeneralProficiency	-	-	-	-	100	-	100
			Total	**16**	**1**	**14**	**24**	**350**	**450**	**800**

B.Sc.(H)(Chemistry)-Semester3

S. No	Category	CourseCode	Course	Periods			Credit	EvaluationScheme		
				L	T	P		Internal	External	Total
1	CC-5	BAS311	InorganicChemistry-II	4	-	-	4	40	60	100
2	CC-6	BAS312	OrganicChemistry-II	4	-	-	4	40	60	100
3	CC-7	BAS313	PhysicalChemistry-III	4	-	-	4	40	60	100
4	GEC-3		Generic Elective Course(Theory) Generic Elective-III	4	-	-	4	40	60	100
5	LC-5	BAS361	InorganicChemistry-II(Lab)	-	-	4	2	50	50	100
6	LC-6	BAS362	OrganicChemistry-II(Lab)	-	-	4	2	50	50	100
7	LC-7	BAS363	PhysicalChemistry-III(Lab)	-	-	4	2	50	50	100
8	DGP-3	BGP311	Discipline&GeneralProficiency	-	-	-	-	100	-	100
			Total	**16**	**-**	**12**	**22**	**310**	**390**	**700**

ValueAddedCourse: It is an audit course. The performance of the student in thiscourse will not be counted in the overall result however the student has to pass itcompulsorilywith 45% marks.

1	VAAC-1	TMUGS-301	ManagingSelf	2	1	-	-	50	50	100
2	VAAC-2	TMUGE301	English Communication -III	2	-	2	-	40	60	100

B.Sc.(H)(Chemistry)-Semester4

S. No	Category	CourseCode	Course	Periods			Credit	EvaluationScheme		
				L	T	P		Internal	External	Total
1	CC-8	BAS419	InorganicChemistry-III	4	-	-	4	40	60	100
2	CC-9	BAS412	OrganicChemistry-III	4	-	-	4	40	60	100
3	CC-10	BAS413	PhysicalChemistry-IV	4	-	-	4	40	60	100
4	GEC-4		Generic Elective Course: GenericElective-IV	4	-	-	4	40	60	100
5	LC-8	BAS461	InorganicChemistry-III(Lab)	-	-	4	2	50	50	100
6	LC-9	BAS462	OrganicChemistry-III(Lab)	-	-	4	2	50	50	100
7	LC-10	BAS465	PhysicalChemistry-IV(Lab)	-	-	4	2	50	50	100
8	DGP-4	BGP411	Discipline& GeneralProficiency	-	-	-	-	100	-	100
			Total	**16**	**-**	**12**	**22**	**310**	**390**	**700**

ValueAddedCourse:

1	VAAC-3	TMUGS-401	ManagingWorkandOthers	2	1	-	-	50	50	100
2	VAAC-4	TMUGE-401	English Communication -IV	2	-	2	-	40	60	100

MOOCCourse:

1	MOOC-1	MOOC12	MOOC Program – I(Optional)	-	-	-	2	-	100	100

B.Sc. (H)(Chemistry)-Semester 5

S. No	Category	Course Code	Course		Periods			Credit	EvaluationScheme		
					L	T	P		Internal	External	Total
1	CC-11	BAS525	OrganicChemistry-IV		4	-	-	4	40	60	100
2	CC-12	BAS526	PhysicalChemistry-V		4	-	-	4	40	60	100
3	MC-2	BHM515	HumanValues&ProfessionalEthics		3	-	-	3	40	60	100
DSE-I											
4	DSE-1		DisciplineSpecificElectiveCourses	Discipline SpecificElectiveCourse-I	4	-	-	4	40	60	100
5	DSE-1			DisciplineSpecific ElectiveCourse-I(Lab)	-	-	4	2	50	50	100
6	OEC-1		Open Course	OpenElective-I	3	-	-	3	40	60	100
7	LC-11	BAS561	OrganicChemistry-IV(Lab)		-	-	4	2	50	50	100
8	LC-12	BAS562	PhysicalChemistry-V(Lab)		-	-	4	2	50	50	100
9	PROJ-1	BAS598	IndustrialTraining&Presentation		-	-	6	3	50	50	100
10	DGP-5	BGP511	Discipline&GeneralProficiency		-	-	-	-	100	-	100
			Total		**18**	**-**	**18**	**27**	**400**	**500**	**900**

Value Added Course:

1	VAAC-3	TMUGA-501	FoundationinQuantitative Aptitude	2	1	-	-	40	60	100

MOOCCourse:

1	MOOC-2	MOOC13	MOOC Program – II(Optional)	-	-	-	2	-	100	100

B.Sc.(H)(Chemistry)-SemesterVI

S. No	Category	Course Code	Course		Periods			Credit	EvaluationScheme		
					L	T	P		Internal	External	Total
1	CC-13	BAS624	InorganicChemistry-IV		4	-	-	4	40	60	100
2	CC-14	BAS625	OrganicChemistry-V		4	-	-	4	40	60	100
DSE-II											
3	DSE-3		DisciplineSpecificElectiveCourses	Discipline SpecificElectiveCourse-II	4	-	-	4	40	60	100
4	DSE-4			Discipline SpecificElective Course-II(Lab)	-	-	4	2	50	50	100
DSE-III											
5	DSE-5		Discipline Specific ElectiveCourses	DisciplineSpecific ElectiveCourse-III	4	-	-	4	40	60	100
6	DSE-6			Discipline SpecificElective Course-III(Lab)	-	-	4	2	50	50	100
7	OEC-2		OpenCourse	OpenElective-II	3	-	-	3	40	60	100
8	LC-13	BAS661	InorganicChemistry-IV(Lab)		-	-	4	2	50	50	100
9	LC-14	BAS662	OrganicChemistry-V(Lab)		-	-	4	2	50	50	100
10	DGP-6	BGP611	Discipline&GeneralProficiency		-	-	-	-	100	-	100
			Total		**19**	**-**	**16**	**27**	**400**	**500**	**900**

ValueAddedCourse:

1	VAAC-4	TMUGA-201	AnalyticalReasoning	2	1	-	-	40	60	100

Study & Evaluation Scheme

Annexure-II

M.Sc. (Chemistry)-Semester I

S. No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-1	MCH111	Inorganic Chemistry-I	4	-	-	4	40	60	100
2	CC-2	MCH112	Organic Chemistry-I	4	-	-	4	40	60	100
3	CC-3	MCH113	Physical Chemistry-I	4	-	-	4	40	60	100
4	AECC-1	MAT115	Research Methodology	3	1	-	4	40	60	100
5	LC-1	MCH161	Inorganic Chemistry-I (Lab)	-	-	4	2	50	50	100
6	LC-2	MCH162	Physical Chemistry-I (Lab)	-	-	4	2	50	50	100
7	SEC-1	MCH165	Computer Skills for Chemist (Lab)			2	1	50	50	100
8	DGP-1	MGP111	Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	15	1	10	21	310	390	700

Value Added Course: It is an optional course. The performance of the student in this course will not be counted in the overall result.

1	VAC-1	TMUPA-101	Elementary Arithmetic & Analytical Reasoning	2	1	-	-	40	60	100
2	VAC-2	TMUPS-101	Managing Self	2	1	-	-	50	50	100

M.Sc. (Chemistry)-Semester II

S. No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-4	MCH211	Inorganic Chemistry-II	4	-	-	4	40	60	100
2	CC-5	MCH212	Organic Chemistry-II	4	-	-	4	40	60	100
3	CC-6	MCH213	Physical Chemistry-II	4	-	-	4	40	60	100
4	CC-7	MCH214	Spectroscopy-I	4	-	-	4	40	60	100
5	LC-3	MCH261	Inorganic Chemistry-II (Lab)	-	-	4	2	50	50	100
6	LC-4	MCH262	Organic Chemistry-II (Lab)	-	-	4	2	50	50	100
7	DGP-2	MGP211	Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	16	-	8	20	260	340	600

*Value Added Course:

1	VAC-3	TMUPA-201	Progressive Algebra & Data Management	2	1	-	-	40	60	100
2	VAC-4	TMUPS-201	Managing Work and Others	2	1	-	-	50	50	100

MOOC Course:

1	MOOC-1	MOOC12	MOOC Program –I (Optional)	-	-	-	2	-	100	100

M.Sc. (Chemistry)-Semester III

S. No	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-8	MCH311	Spectroscopy-II		4	-	-	4	40	60	100
2	AECC-2	MSC011	Industrial Safety & Health Hazards		4	-	-	4	40	60	100
3	DSE-1			Discipline Specific Elective Course-I	4	-	-	4	40	60	100
4	DSE-2			Elective Course-II Discipline Specific	4	-	-	4	40	60	100
5	LC-5	MCH361	Organic Chemistry II (Lab)		-	-	4	2	50	50	100
6	LC-6	MCH362	Physical Chemistry II (Lab)		-	-	4	2	50	50	100
7	PROJ-1	MCH392	Industrial Training & Presentation		-	-	-	3	50	50	100
8	DGP-3	MGP311	Discipline & General Proficiency		-	-	-	-	100	-	100
			Total		16	-	8	23	310	390	700

MOOC Course:

1	MOOC-2	MOOC13	MOOC Program –II (Optional)	-	-	-	2	-	100	100

M.Sc. (Chemistry)-Semester IV

S. No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-09	MCH411	Bio-Chemistry	4	-	-	4	40	60	100
2	CC-10	MCH412	Photochemistry & Disconnection approach	4	-	-	4	40	60	100
3	CC-11	MCH416	Environmental Chemistry	4	-	-	4	40	60	100
4	AECC-3	MHM420	Entrepreneurship	4	-	-	4	40	60	100
5	DSE-3		Elective: Discipline Specific Elective Course-III	4	-	-	4	40	60	100
6	LC-7	MCH461	Environmental Chemistry (Lab)	-	-	4	2	50	50	100
7	PROJ-2	MCH492	Project	-	-	8	4	50	50	100
8	DGP-4	MGP411	Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	20	-	12	26	300	400	700

ELECTIVE COURSES OFFERED

S.No	Code	Course	L	T	P	Credit
Semester III-Discipline Specific Elective Course-I -(Any one)						
1	MCH312	Polymer Chemistry	4	-	-	4
2	MCH313	Chemistry of Nano-materials	4	-	-	4
3	MCH314	Chemistry of Natural Products	4	-	-	4
Semester III-Discipline Specific Elective Course-II -(Any one)						
4	MCH315	Organomettalic Chemistry	4	-	-	4
5	MCH316	Medicinal Chemistry	4	-	-	4
6	MCH317	Quantum Chemistry & Solid State Chemistry	4	-	-	4
Semester IV-Discipline Specific Elective Course-III -(Any one)						
7	MCH413	Bio-Inorganic Chemistry	4	-	-	4
8	MCH414	Bio-Organic Chemistry	4	-	-	4
9	MCH415	Bio-Physical chemistry	4	-	-	4
10	MCH417	Heterocyclic Chemistry	4	-	-	4

Minutes of the Meeting

BOARD OF STUDIES (BOS)

Department of Electrical Engineering

Date: 4 December, 2021

Venue: Director Office/Online, FOE, TMU

Faculty of Engineering

Teerthanker Mahaveer University

Moradabad

www.tmu.ac.in

Teerthanker Mahaveer University, Moradabad

Faculty of Engineering, Electrical Engineering Department

Minutes of BoS Meeting

A meeting of Board of Studies has been held in Director's office, Faculty of Engineering on 04/12/2021. Following points have been discussed regarding revision in syllabus and scheme for existing B.Tech. (Electrical Engineering) program, batch 2021-22. Following members were present in meeting:

1. Prof R.K Dwivedi, Director& Principal FoE
2. Prof. Naimul Hasan, Dept.of EE, Zamia Milia Islamia (External Expert)
3. Dr. Ashwani Kumar, Professor, Electrical Engineering Department, NIT Kurukshetra (External Expert)
4. Dr Garima Goswami, HoD, EE Department(Member)
5. Mr. Pradeep Kr. Verma, CoD EE Department (Member)
6. Mr. Raghvendra Kumar Singh, EE Department (Member)
7. Prof. Amit Sharma, Principal, Polytechnic (Member)

The following points were discussed in BoS:

1. Electrical Department proposed two specialisations in Electric Vehicle, Renewable Energy & Energy Management in collaboration with few of leading names in this domain. Following changes are proposed **(Annexure-I)**:
   I. Course named "Electric Vehicle" is proposed in Semester-VI.
   II. Course named "Modern Commercial Energy Sources" is proposed in semester-VII.
   III. Course named "Power Electronic Converters for EV Charging" is proposed under program Elective-III in semester-VII.
   IV. Electric Vehicle Lab is proposed in semester-VIII under program elective-VII.

2. Department also suggested to review the credits of its core subjects on which external members suggested to reduce the credit of other non-core subjects and keep it in coherence the AICTE guidelines.
3. BoS Committee experts have suggested for no further change in syllabus of Basic Electrical Engineering EEE117/EEE217.
4. BoS Committee experts have suggested for no further change in syllabus of Electrical Machine EEE311.
5. The external members also approved Course code EEC862 for the electronic circuit lab to be changed by EEC864 for batch 2018-19 **(Annexure-I)**.
6. Department has proposed to include GP marks under EGP111, EGP211, EGP311, EGP411, EGP511, EGP611, EGP711 and EGP811in respective semesters from 2019-20 onwards.

The meeting is ended with vote of thanks.

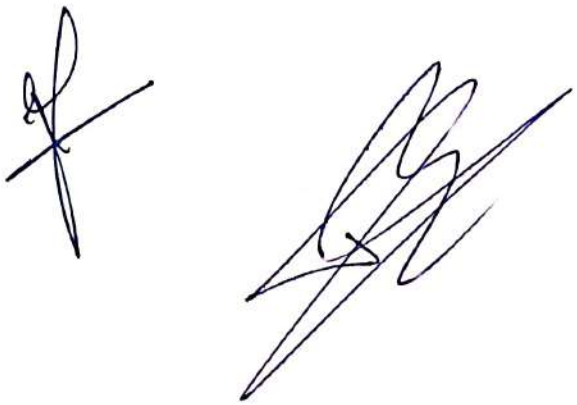
Study & Evaluation Scheme

B.Tech (Electrical Engineering)-Semester I

S. No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	BSC-1	EAS116	Engineering Mathematics-I	3	1	-	4	40	60	100
2	BSC-2	EAS112	Engineering Physics	3	1	-	4	40	60	100
		EAS113	Engineering Chemistry							
3	ESC-1	EEE117	Basic Electrical Engineering	3	1	-	4	40	60	100
		EEC111	Basic Electronics Engineering							
4	MC-1	TMU101	Environmental Studies	2	1	-	3	40	60	100
5	HSMC-1	TMUGE101	English Communication- I	2	-	2	3	40	60	100
6	LC-1	EAS162	Engineering Physics (Lab)	-	-	2	1	50	50	100
		EAS163	Engineering Chemistry (Lab)							
7	LC-2	EEE161	Basic Electrical Engineering (Lab)	-	-	2	1	50	50	100
		EEC161	Basic Electronics Engineering (Lab)							
8	LC-3	EME161	Engineering Drawing (Lab)	-	-	4	2	50	50	100
		EME162	Workshop Practice (Lab)							
9	DGP-1	EGP111	Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**13**	**4**	**10**	**22**	**350**	**450**	**800**

B.Tech (Electrical Engineering)-Semester II

S. No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	BSC-3	EAS211	Engineering Mathematics-II	3	1	-	4	40	60	100
2	BSC-4	EAS212	Engineering Physics	3	1	-	4	40	60	100
		EAS213	Engineering Chemistry							
3	ESC-2	EEE217	Basic Electrical Engineering	3	1	-	4	40	60	100
		EEC211	Basic Electronics Engineering							
4	ESC-3	ECS212	Computer System & Programming in C++	3	-	-	3	40	60	100
5	HSMC-2	TMUGE201	English Communication- II	2	-	2	3	40	60	100
6	LC-4	EAS262	Engineering Physics (Lab)	-	-	2	1	50	50	100
		EAS263	Engineering Chemistry (Lab)							
7	LC-5	EEE261	Basic Electrical Engineering (Lab)	-	-	2	1	50	50	100
		EEC261	Basic Electronics Engineering (Lab)							
8	LC-6	ECS262	Computer System &Programming in C++ (Lab)	-	-	2	1	50	50	100
9	LC-7	EME261	Engineering Drawing (Lab)	-	-	4	2	50	50	100
		EME262	Workshop Practice (Lab)							
10	DGP-2	EGP211	Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**14**	**3**	**12**	**23**	**400**	**500**	**900**



B.Tech (Electrical Engineering)-Semester III

S. No	Category	Course Code	Course	Periods			Evaluation Scheme			
				L	T	P	Credit	Internal	External	Total
1	PCC-1	EEE311	Electrical Machines – I	3	1	-	4	40	60	100
2	PCC-2	EEE312	Circuit Theory	3	1	-	4	40	60	100
3	ESC-4	EEC311	Engineering Electromagnetics	3	1	-	3	40	60	100
4	ESC-5	EEC312	Digital Logic & Circuits	3	1	-	3	40	60	100
5	ESC-6	EEC315	Signals & Systems	3	1	-	3	40	60	100
6	HSMC-3	TMUGE301	English Communication- III	2	-	2	3	40	60	100
7	LC-8	EEE361	Electrical Machines – I (Lab)	-	-	2	1	50	50	100
8	LC-9	EEC361	Digital Logic & Circuits (Lab)	-	-	2	1	50	50	100
9	DGP-3	EGP311	Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**17**	**5**	**6**	**22**	**340**	**460**	**800**

Following additional Course for Lateral Entry Students with B.Sc./Polytechnic background to be taken in III semester and all should pass with minimum of 45% marks for obtaining the degree: credits will not be added

1	LC	EME161/261	Engineering Drawing (Lab)	-	-	4	-	50	50	100
2		TMU101	Environmental Studies	2	1	-	-	40	60	100

Value Added Course:
It is an audit course. The performance of the student in this course will not be counted in the overall result however the student has to pass it compulsorily with 45% marks.

1	VAC-I	TMUGA-301	Foundation in Quantitative Aptitude	2	1	-	-	40	60	100

B.Tech (Electrical Engineering)-Semester IV

S. No	Category	Course Code	Course	Periods			Evaluation Scheme			
				L	T	P	Credit	Internal	External	Total
1	PCC-3	EEE411	Electrical Machines – II	3	1	-	4	40	60	100
2	PCC-4	EEE412	Electrical Measurements and Measuring Instruments	3	-	-	3	40	60	100
3	PCC-5	EEE413	Network Analysis & Synthesis	3	1	-	4	40	60	100
4	ESC-7	ECS412	Object oriented Programming using JAVA	3	1	-	4	40	60	100
5	LC-10	EEE461	Electrical Machines – II (Lab)	-	-	2	1	50	50	100
6	LC-11	EEE462	Electrical Measurements and Measuring Instruments (Lab)	-	-	2	1	50	50	100
7	LC-12	EEE463	Network Analysis &Synthesis (Lab)	-	-	2	1	50	50	100
8	LC-13	ECS461	Object oriented Programming using JAVA (Lab)	-	-	2	1	50	50	100
9	DGP-4	EGP411	Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**12**	**3**	**8**	**19**	**360**	**440**	**800**

*Skill based Training/Internship of 4 weeks duration from a reputed Industry/organization after completion of 4th semester end-semester examination.

Following additional Courses for Lateral Entry Students with B.Sc./Polytechnicbackground to be taken in IV semester and all should pass with minimum of 45% marks for obtaining the degree: credits will not be added

1	LC	EME162/262	Workshop Practice (Lab)	-	-	4	-	50	50	100

***Value Added Course:**

1	VAC-2	TMUGA-401	Analytical Reasoning	2	1	-	-	40	60	100

B.Tech (Electrical Engineering)-Semester V

S. No	Category	Course Code	Course	Periods			Evaluation Scheme			
				L	T	P	Credit	Internal	External	Total
1	PCC-6	EEE511	Control Systems	3	1	-	4	40	60	100
2	PCC-7	EEE512	Power Electronics	3	1	-	4	40	60	100
3	PCC-8	EEE513	Power System Analysis-I	3	1	-	4	40	60	100
4	HSMC-4	TMUGE501	English Communication- IV	2	-	2	3	40	60	100
5	ESC-8	EEC511	Microprocessor & Applications	3		-	3	40	60	100
6	LC-14	EEE561	Control Systems (Lab)	-	-	2	1	50	50	100
7	LC-15	EEE562	Power Electronics (Lab)	-	-	2	1	50	50	100
8	LC-16	EEC561	Microprocessor & Applications (Lab)	-	-	2	1	50	50	100
9	PROJ-1	EEE592	Skill based Practical Training presentation	-	-	-	2	50	50	100
10	DGP-5	EGP511	Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**14**	**3**	**8**	**23**	**400**	**500**	**900**

***Value Added Course:**

1	VAC-3	TMUGA-501	Modern Algebra and Data Management	2	1	-	-	40	60	100
2	VAC-4	TMUGS-501	Managing Self	2	1	-	-	40	60	100

MOOC Course:

1	MOOC-1	MOOC01	MOOC Program -I (Optional)	-	-	-	2	-	100	100

B.Tech (Electrical Engineering)-Semester VI

S. No	Category	Course Code	Course		Periods			Evaluation Scheme			
					L	T	P	Credit	Internal	External	Total
1	PCC-9	EEE611	Electrical Drives & Controls		3	1	-	4	40	60	100
2	PCC-10	EEE612	Power System Analysis-II		3	1	-	4	40	60	100
3	PEC-1		Program Elective	Program Elective-I	3	1	-	4	40	60	100
4	PEC-2			Program Elective-II	3	1	-	4	40	60	100
5			Electrical Vehicle		3	1	-	4	40	60	100
6	HSMC-5	EHM613	Human values & Professional Ethics		2	-	-	2	40	60	100
7	LC-17	EEE661	Electrical Drives & Controls (Lab)		-	-	2	1	50	50	100
8	LC-18	EEE665	Modelling & Simulation using MATLAB-Simulink (Lab)		-	1	2	2	50	50	100
9	DGP-6	EGP611	Discipline & General Proficiency		-	-	-	-	100	-	100
			Total		**17**	**6**	**4**	**25**	**340**	**460**	**800**

*Industrial Training of 6 weeks duration from a reputed Industry/organization after completion of 6th semester end-semester examination.

***Value Added Course:**

1	VAC-5	TMUGA-601	Advance Algebra and Geometry	2	1	-	-	40	60	100
2	VAC-6	TMUGS-601	Managing Work and Others	2	1	-	-	40	60	100

MOOC Course:

1	MOOC-2	MOOC02	MOOC Program –II (Optional)	-	-	-	2	-	100	100

B.Tech (Electrical Engineering)-Semester VII

S. No	Category	Course Code	Course		Periods			Evaluation Scheme			
					L	T	P	Credit	Internal	External	Total
1	PCC-11	EEE711	Switchgear & Protection		3	-	-	3	40	60	100
2	PCC-12		Modern Commercial Energy Sources		3	-	-	3	40	60	100
3	PEC-3		Program Elective	Program Elective-III	3	1		4	40	60	100
4	PEC-4			Program Elective-IV	3		-	3	40	60	100
5	OEC-1		Open Elective	Open Elective-I	3	-	-	3	40/50	60/50	100
6	LC-19	EEE761	Switchgear & Protection (Lab)		-	-	2	1	50	50	100
7	LC-20	EEC761	Electronics Devices & Circuits (Lab)		-	-	4	2	50	50	100
		EEC762	Design and installation of Solar Photovoltaic System (Lab)		-	1	2				
8	PROJ-2	EEE792	Industrial Training& Presentation		-	-	-	2	50	50	100
9	PROJ-3	EEE798	Project Work Phase-I		-	-	10	5	100	-	100
10	DGP-7	EGP711	Discipline & General Proficiency		-	-	-	-	100	-	100
			Total		15	1/2	16/14	26	450/460	450/440	900

MOOC Course:

1	MOOC-3	MOOC03	MOOC Program –III (Optional)	-	-	-	2	-	100	100

B.Tech (Electrical Engineering)-Semester VIII

S. No	Category	Course Code	Course		Periods			Evaluation Scheme			
					L	T	P	Credit	Internal	External	Total
1	PCC-13	EEE811	Electric Power System Operation		3	1	-	4	40	60	100
2	PEC-5		Program Elective	Program Elective-V	3	1	-	4	40	60	100
3	PEC-6			Program Elective-VI	3	1	-	4	40	60	100
4	[illegible]		Program Elective (Lab)	Program Elective-VII	-	-	2	1	50	50	100
5	OEC-2		Open Elective	Open Elective-II	3	-	-	3	40/50	60/50	100
6	PROJ-4	EEE898	Project Work Phase –II		-	-	6	3	50	50	100
7	DGP-8	EGP811	Discipline & General Proficiency		-	-	-	-	100	-	100
			Total		**15**	**-**	**08**	**19**	**260/270**	**340/330**	**600**

MOOC Course:

1	MOOC-4	MOOC04	MOOC Program –IV (Optional)	-	-	-	2	-	100	100

ELECTIVE COURSES OFFERED

S.No	Code	Course	L	T	P	Credit
		Semester VI - Program Elective I-(Any one)				
		Specialization: Signal Processing				
1	EEC612	Embedded System	3	1	0	4
2	EEC617	Microcontroller Hardware, Programming & its Application (Arduino)	3	1	0	4
		Semester VI - Program Elective II -(Any one)				
		Specialization: Soft Computing Techniques				
3	EEE620	Artificial Neural Network	3	1	0	4
4	EEE621	Advanced Control System	3	1	0	4
5	ECS611	Database Management System	3	1	0	4
6	ECS631	Network security & cryptography	3	1	0	4
		Semester VII- Program Elective III -(Any one)				
		Specialization: Power System Engineering				
7	EEE713	High Voltage Engineering	3	1	0	4
8	EEE714	Power Generation Systems	3	1	0	4
9		Power Electronic Converters for EV Charging	3	1	0	4
		Semester VII- Program Elective IV-(Any one)				
		Specialization: Industrial Management Theory				
10	EHM731	Principle of Management	3	0	0	3
11	EHM732	Industrial Sociology	3	0	0	3
12	EHM733	Organizational Behaviour	3	0	0	3
13	EHM734	Engineering and Managerial Economics	3	0	0	3
		Semester VIII- Program Elective V-(Any one)				
		Specialization: Semiconducting Devices and power Transmission				
15	EEE812	FACTS Technology	3	1	0	4
16	EEC814	Electronic Circuits	3	1	0	4
17	EEE821	EHV AC/DC Transmission	3	1	0	4
		Semester VIII- Program Elective VI-(Any one)				
		Specialization: Industrial application				
18	EHM831	Machine learning & Data Analytics	3	1	0	4
19	EHM832	Total Quality Management	3	1	0	4
20	EHM833	Entrepreneurship	3	1	0	4
		Semester VIII- Program Elective VII (Lab)-(Any one)				
21	EEE861	Power System Simulation (Lab)	0	0	2	1
22	EEC864	Electronic Circuits (Lab)	0	0	2	1
23		Electric Drive Lab	0	0	2	1

Minutes of the Meeting

BOARD OF STUDIES (BOS)

Department of Physics

Date: 4 December, 2021

Venue: Director Office/Online, FOE, TMU

Faculty of Engineering

Teerthanker Mahaveer University

Moradabad

www.tmu.ac.in

Teerthanker Mahaveer University
Faculty of Engineering
Department of Physics
Minutes of Meeting- "Board of Study"
Dated: 04 /12/2021

04.12.2021

The meeting of the board of studies in Physics was held on 04 /12/2021 at 1:00 PM in virtual mode, Director Office, Faculty of Engineering, Teerthanker Mahaveer University, Moradabad.
Following members were present in the meeting:

1. Prof. R. K. Dwivedi, Faculty of Engineering, Director
2. Dr. Amit K. Sharma, Associate Professor & Head, Department of Physics, Chairperson
3. Dr. S. P. Pandey, Professor, Department of Physics, FOE, BoS Member
4. Dr. Ajay Kumar Upadhayay, Associate Professor, Department of Physics, FOE, BoS Member
5. Dr. Vishnu Prasad Shrivastava, Assistant Professor, Department of Physics, FOE, BoS Member
6. Dr. Pavan Kumar Singh, Assistant Professor, Department of Physics, FOE, BoS Member

Two Experts from another University nominated by the Vice-Chancellor

1. Dr. Prabhakar Singh, Professor, Department of Physics, IIT-BHU, Varanasi.
2. Dr. R. K. Shukla, Professor, Department of Physics, University of Lucknow, Lucknow

Following points are proposed/ suggested by the department in the meeting held:

1. This has to be taking care that B.Sc.(Hons.) Physics & M.Sc. Physics programmes of reputed universities have maximum 140 credits & maximum 80 credits respectively, are required to complete the degree while our university programmes of B.Sc.(Hons.) Physics & M.Sc. Physics have maximum 155 credits & maximum 105 credits. In view of this point, students are overloaded & they do not have enough time for curricular activities and self study. Therefore, department suggests for rethinking and optimizing the credits according to Physics programme of well-known Universities.
2. Two experiments are needed to be replaced in Engineering Physics Lab (EAS161/EAS162) discussed & forwarded for further modification.

S. No.	Experiment to be replaced	Remarks/Justifications	Replaced with
i.	To determine the Flashing & Quenching of Neon bulb.	Instrument set up is not working properly and needs thorough investigation by company's service engineer	To determine Resolving power of a telescope.
ii.	To determine the value of Boltzmann Constant by studying Forward	Instrument set up is showing large error during handling and needs thorough investigation by company's	To determine wavelength of spectral lines of Hg source using plane

	Characteristics of a Diode.	service engineer	diffraction grating.

3. Minor typographical error in title of Engineering Physics-I to be corrected as Engineering Physics in all branches of B.Tech.
4. Due to overloaded of 5th semester B.Sc.(H) Physics, this is suggested to shift the paper Semiconductor Physics-BAS421 from 4th Semester to 3rd Semester and also shift the paper Electromagnetic Theory- BAS520 from 5th Semester to 4th Semester, respectively.
5. Correction of typographical error in the two courses code of B.Sc.(H) Physics namely Thermal Physics & Introduction to Probability for Academic year 2019-20 & 2020-21

S. No.	Course Name	Old Code	New Code
1	Thermal Physics	BAS418	BAS435
2	Introduction to Probability	BAS435	BAS418

6. Solid State Physics-BAS524, Elements of Modern Physics-BAS314, Introduction to Nano Science and Technology-BAS013 and Nano-science &Technology -MPH315 papers have suggested for minor change.
7. Single topic (Direct and Indirect Bandgap Semiconductors from UNIT-2) of repetition (with Unit-1) has suggested to be removed in the paper Physics & Technology of Semiconductor Devices- MPH 317.
8. Unit 3 of Quantum Mechanics -BAS523 paper, B.Sc.(H) Physics, has suggested for minor correction.
9. Two new open elective papers (for 3rd & 4th semesters, respectively) have suggested to be introduced in M.Sc. Physics, as following -
   - Analog and Digital Systems
   - Photonics
10. Transfer the topics "Thermodynamic Potentials, First and second order Phase Transitions with examples, Clausius Clapeyron Equation and Ehrenfest equations." from unit 2 to unit 3 as thermodynamic potentials are related to Maxwell relation and unit 2 is lengthy by including these topics in the course of BAS320-Thermal Physics, B.Sc.(H) Physics.
11. Department proposes two program of semester based general B.Sc. (Physics, Computer Science, Mathematics,) of 132 maximum credits.
12. Department proposed Course matrix/structure based upon CBCS model frame work for 2019-20 batches onwards for B.Sc.(H) Physics & M.Sc. Physics. Program Outcomes, Program Specific Outcomes, course outcomes will be introduced from batch 2019-20 onwards.
13. GP marks should be included in total marks of each semester of B.Sc.(H) Physics & M.Sc. Physics from 2019-20 onwards.

Point-wise suggestions of External Experts

1. Agenda point no.1 is recommended to be reduced up to levels of max. 145 credits for UG and Max. 85 credits for PG as mentioned below.

Name of the Programme	Total CBCS Credits as per TMU*	Total CBCS Credits as per UGC	Total CBCS Credits as per Delhi University	Total CBCS Credits as per Calcutta Univ.
B. Sc. (Hons.) Physics	155*	140	140	140
M.Sc. Physics	105*	80	80	80

* Above shown Maximum credits excluding non-credits course like CTLD.

BoS agreed for the following removal/changed the overstrain of the students of B.Sc.(Hons.) Physics and M.Sc. Physics programme.

- BoS recommended for reducing the overstrain in B.Sc.(Hons.) Physics with suggesting that the students of this programme is taking extra 3+3 hrs load in the non-core subjects of English Communication-III (TMUGE301) & Managing Self (TMUGS-301) in 3rd semester and English Communication-IV (TMUGE401) & Managing Work and Others (TMUGS-401) in 4th semester, respectively. In this case, BoS agreed to derive one paper out of above two as mentioned above in the 3rd & 4th semesters for reducing the overstrain on the students.

- BoS recommended for reducing the overstrain in M.Sc. Physics, 4th semester with suggesting that the subject entitled, "Physics and our world- MPH431", shifted from core paper to Discipline Specific Elective Course-III (4 credits paper).

- BoS also recommended for the converting all the non-credits courses as optional course so that the students can opt as per their interest/capability careers especially in M.Sc. Physics.

2. If some of the experiments are not working properly during the semester, BoS suggested to replace with the virtual lab for some experiments of Physics lab 1& 2, may also be conducted through online platforms i.e. Virtual lab- https://www.vlab.co.in/ in the programme of B.Tech. B.Sc.(Hons.) & M.Sc.
3. Correct the typographical error as mentioned in the agenda point no.2.
4. Due to overloaded of 5th semester B.Sc.(H) Physics, the shown paper can be shifted (one paper from 5th Sem to 4th and one paper from 4th to 3rd sem) as proposed in the agenda point no.4.
5. Correct the typographical error in the code of two courses of B.Sc.(H) Physics namely Thermal Physics & Introduction to Probability for Academic year 2019-20 & 2020-21.

6. Solid State Physics-BAS524, Elements of Modern Physics-BAS314, Introduction to Nano Science and Technology-BAS013 [B.Sc.(Hons.) Physics] and Nano-science &Technology - MPH315 (M.Sc. Physics) papers have suggested for minor change (**Annexure-I**), accordingly.
7. The single topic, "Direct and Indirect Bandgap Semiconductors" in the Units 1 & 2 has suggested to be removed from UNIT 2 in the paper of Physics & Technology of Semiconductor Devices- MPH 317.
8. BoS recommended for reducing the unit 3 due to much lengthy and suggested to remove the some topics ("practical examples like metal-vacuum interface, contact potential between metals, bilayer and sandwiched, thin film etc.,") of Unit 3 of Quantum Mechanics -BAS523 paper as below-

   Current syllabus of Quantum Mechanics-BAS523:UNIT-3: Application of Schrödinger equation-I: Square well potentials, "practical examples like metal-vacuum interface, contact potential between metals, bilayer and sandwiched, thin film etc.", bound states in deep potential well and finite potential well, double, well potentials, delta function potentials and examples like electron sharing in covalent bonds.

   Suggested syllabus of Quantum Mechanics-BAS523:UNIT-3: Application of Schrödinger equation-I: Square well potentials, bound states in deep potential well and finite potential well, double, well potentials, delta function potentials and examples like electron sharing in covalent bonds.

9. BoS members suggested adding both the new open elective papers (Analog and Digital Systems for 3rd & Photonics for 4th semesters, respectively) in M.Sc. Physics, as given in **Annexure-II**.
10. BoS members suggested to transfer the suggested topics from unit 2 to 3 as given in the proposed agenda point no. 10.
11. The Department of Physics, Mathematics & Computer Science has planned to introduce the new program of **B.Sc. in Physics, Mathematics, Computer Science / Statistics** of **135 maximum credits** from the session 2022-23 onwards. BoS is recommended for a new program of semester based general B.Sc. (PMC or PMS) of 135 maximum credits to open from coming session 2022-23, BoS has also approved the proposed credits as presented in the course matrix as given in **Annexure-III.**
12. BoS recommended Course matrix/structure based upon CBCS model frame work for 2019-20 batches onwards for B.Sc.(H) Physics & M.Sc. Physics. Program Outcomes, Program Specific Outcomes, course outcomes will be introduced from batch 2019-20 onwards.
13. BoS recommended to add the GP marks in each semester of B.Sc.(H) Physics & M.Sc. Physics.

Meeting ended with a vote of Thanks.

Annexure-I

Following papers have suggested for minor change -

- Solid State Physics-BAS524

Current syllabus BAS524 (2020-21)

Course Code: BAS524	**B.Sc.(H) Physics- Semester-V** **Solid State Physics**	**L-4** **T-0** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Remembering** the Lorentz force to understand the Hall effect.	
CO2.	**Understanding** the physical significance in elementary of lattice dynamics, magnetic, dielectric and ferroelectric properties of matter, etc.	
CO3.	**Understanding** the physical properties of crystal structure like, lattice translation vectors, lattice with a basis unit cell.	
CO4.	**Understanding** the magnetic, dielectric and superconducting properties materials.	
CO5.	**Applying** the Bragg law to deduce the crystal structure of a material.	
Course Content:		
Unit-1	**Crystal Structure:** Solids: Amorphous and Crystalline Materials.Lattice: Translation Vectors, Lattice with a Basis Unit Cell, MillerIndices, Reciprocal Lattice, Types of Lattices, Brillouin Zones. Diffraction of X-rays by Crystals, Bragg's Law.	**8Hours**
Unit-2	**Elementary Lattice Dynamics:** Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains; Acoustical and Optical Phonons, Qualitative Description of the Phonon Spectrum in Solids. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids; T3 law.	**8Hours**
Unit-3	**Magnetic Properties of Matter:** Dia-, Para-, Ferri- and Ferromagnetic Materials, Classical Langevin Theory of dia and Paramagnetic Domains, Quantum Mechanical Treatment of Para magnetism, Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains, Discussion of B-H Curve, Hysteresis and Energy Loss.	**8Hours**
Unit-4	**Dielectric and Ferroelectric Properties of Materials:** Electric Susceptibility. Polarizability, Clausius-Mosotti Equation, Classical Theory of Electric Polarizability, Langevin-Debye equation. Plasma Oscillations, Plasma Frequency, Plasmons, Structural phase transition, Classification ofcrystals, Piezoelectric effect, Pyroelectric effect, Ferroelectric effect, Curie-Weiss Law, Ferroelectric domains, PE hysteresis loop.	**8Hours**
Unit-5	**Superconductivity and Elementary band theory:** Critical Temperature. Critical magnetic field, Meissner effect. Type 1 and	

	type II Superconductors, London's Equation and Penetration Depth. Isotope effect. Idea of BCS theory (theoretically) Kronig Penny model. Band Gap, Conductor, Semiconductor(P and N type) and insulator, Hall Effect, Measurement of conductivity (four probe method) &Hall coefficient	

➢ **Proposed minor Change in Syllabus BAS524**

Course Code: BAS524	**B.Sc.(H) Physics- Semester-V** **Solid State Physics**	**L-4** **T-0** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Remembering** the Lorentz force to understand the Hall effect.	
CO2.	**Understanding** the physical significance in elementary of lattice dynamics, magnetic, dielectric and ferroelectric properties of matter, etc.	
CO3.	**Understanding** the physical properties of crystal structure like, lattice translation vectors, lattice with a basis unit cell.	
CO4.	**Understanding** the magnetic, dielectric and superconducting properties materials.	
CO5.	**Applying** the Bragg law to deduce the crystal structure of a material.	
Course Content:		
Unit-1	**Crystal Structure:** Solids: Amorphous and Crystalline Materials. Lattice: Translation Vectors, Lattice with a Basis Unit Cell, Miller Indices, Reciprocal Lattice, Types of Lattices, Brillouin Zones. Diffraction of X-rays by Crystals, Bragg's Law.	**8Hours**
Unit-2	**Elementary Lattice Dynamics:** Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains; Acoustical and Optical Phonons, Qualitative Description of the Phonon Spectrum in Solids. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids; T3 law.	**8Hours**
Unit-3	**Magnetic Properties of Matter:** Dia-, Para-, Ferri- and Ferromagnetic Materials, Classical Langevin Theory of dia and Paramagnetic Domains, Quantum Mechanical Treatment of Para magnetism (Qualitative) , Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains, Discussion of B-H Curve, Hysteresis and Energy Loss.	**8Hours**
Unit-4	**Dielectric and Ferroelectric Properties of Materials:** Electric Susceptibility. Polarizability, Clausius-Mosotti Equation, Classical Theory of Electric Polarizability, Langevin-Debye equation. Plasma Oscillations, Plasma Frequency, Plasmons, Structural phase	**8Hours**

	transition, Classification of crystals, Piezoelectric effect, Pyroelectric effect, Ferroelectric effect, Curie-Weiss Law, Ferroelectric domains, PE hysteresis loop.	
Unit-5	**Superconductivity and Elementary band theory:** Critical Temperature. Critical magnetic field, Meissner effect. Type I and type II Superconductors, London's Equation and Penetration Depth. Isotope effect. Idea of BCS theory (theoretically) Kronig Penny model. Band Gap, Conductor, Semiconductor(P and N type) and insulator, Hall Effect, Measurement of conductivity (four probe method) & Hall coefficient	

➢ Elements of Modern Physics-BAS314

Current Syllabus

Course Code: BAS314	**B.Sc.(H) Physics- Semester-III Elements of Modern Physics**	**L-3 T-1 P-0 C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Remembering** concepts of Black body radiation, Photoelectric effect and Compton scattering to learn the beginning of quantum mechanics.	
CO2.	**Understanding** Young's two slit interference of light into the two slit interference of particles (e.g. photon, electron, atom etc.)	
CO3.	**Understanding** the matter wave and deducing the Schrodinger wave equation.	
CO4.	**Understanding** the laws of radioactive decay including alpha-, beta and gamma decay, fission and fusion nuclear process.	
CO5.	**Applying** the Heisenberg's uncertainty principle to deduce the Size and structure of atomic nucleus and itsrelation with atomic weigh.	
CO6.	**Applying** the Heisenberg's uncertainty principle to prove the impossibility of an electron being in the nucleus.	
Course Content:		
Unit-1:	**Planck's quantum-I:** Planck's constant and light as a collection of photons; Blackbody Radiation: Quantum theory of Light; Photo electric effect and Compton scattering. De Broglie wavelength and matter waves. Two-Slit experiment with electrons	**8 Hours**
Unit-2:	**Planck's quantum-II:** Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence; Matter waves and wave amplitude; Schrodinger equation for non-relativistic particles	**8 Hours**
Unit-3:	**Schrodinger Equations:** Schrodinger equations, Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being	**8 Hours**

	in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force	
Unit-4:	**Fission and fusion:** Mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Fusion and thermonuclear reactions driving stellar energy.	**8 Hours**
Unit-5:	**Radioactivity:** stability of the nucleus; Law of radioactive decay; Mean life and half-life; Alpha decay; Beta decay- energy released, spectrum and Pauli's prediction of neutrino; Gamma ray emission, energy-momentum conservation: electron-positron pair creation by gamma photons in the vicinity of a nucleus.	**8 Hours**
Text Book:	1. Concepts of Modern Physics, Arthur Beiser, McGraw-Hill.	
Reference Books:	1. Introduction to Quantum Mechanics, David J. Griffith, Pearson Education. 2. Physics for scientists and Engineers with Modern Physics, Jewett and Serway, Cengage Learning. 3. Modern Physics, G.Kaur and G.R. Pickrell, McGraw Hill. ***Latest editions of all the suggested books are recommended**	
Additional electronic reference materials	https://www.youtube.com/watch?v=ymGdrb-pCaI https://www.youtube.com/watch?v=vPJidbP_oLM https://www.youtube.com/watch?v=iMhDYarsfII	

➢ **Proposed Syllabus**

Course Code: BAS314	**B.Sc.(H) Physics- Semester-III** **Elements of Modern Physics**	**L-3** **T-1** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Remembering** concepts of Black body radiation, Photoelectric effect and Compton scattering to learn the beginning of quantum mechanics.	
CO2.	**Understanding** Young's two slit interference of light into the two slit interference of particles (e.g. photon, electron, atom etc.)	
CO3.	**Understanding** the matter wave and deducing the Schrodinger wave equation.	
CO4.	**Understanding** the laws of radioactive decay including alpha-, beta and gamma decay, fission and fusion nuclear process.	
CO5.	**Applying** the Heisenberg's uncertainty principle to deduce the Size and structure of atomic nucleus and its relation with atomic weigh.	
CO6.	**Applying** the Heisenberg's uncertainty principle to prove the impossibility of an electron being in the nucleus.	
Course		

Content:		
Unit-1:	**Planck's quantum-I:** Planck's constant and light as a collection of photons; Blackbody Radiation: Quantum theory of Light; Photo electric effect and Compton scattering. De Broglie wavelength and matter waves. Two-Slit experiment with electrons/photons	**8 Hours**
Unit-2:	**Quantum-II:** linear superposition principle; wave amplitude, Properties and physical significance of wave function, Expectation value, Schrodinger equations, Particle in a box problem.	**8 Hours**
Unit-3:	**Quantum-III:** Heisenberg uncertainty principle, Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle.	**8 Hours**
Unit-4:	**Fission and fusion:** Nature of nuclear force, Mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Fusion and thermonuclear reactions driving stellar energy.	**8 Hours**
Unit-5:	**Radioactivity:** Stability of the nucleus; Law of radioactive decay; Mean life and half-life; Alpha decay; Beta decay- energy released, spectrum and Pauli's prediction of neutrino; Gamma ray emission, energy-momentum conservation: electron-positron pair creation by gamma photons in the vicinity of a nucleus.	**8 Hours**
Text Book:	**1.** Concepts of Modern Physics, Arthur Beiser, McGraw-Hill.	
Reference Books:	**1.** Introduction to Quantum Mechanics, David J. Griffith, Pearson Education. **2.** Physics for scientists and Engineers with Modern Physics, Jewett and Serway, Cengage Learning. **3.** Modern Physics, G.Kaur and G.R. Pickrell, McGraw Hill. ***Latest editions of all the suggested books are recommended**	
Additional electronic reference materials	https://www.youtube.com/watch?v=ymGdrb-pCaI https://www.youtube.com/watch?v=vPJidbP_oLM https://www.youtube.com/watch?v=iMhDYarsfII	

➢ Introduction to Nano Science and Technology-BAS013

Current Syllabus

Unit-1:
Nanoscale Systems: Length, energy, and time scales – Quantum confinement of electrons in semiconductor nanostructures: Quantumconfinement in 3D, 2D, 1D and zero dimensional structures-Size effectand properties of nanostructures- Landauer-Buttiker formalism for conduction in confined geometries - Top down and Bottom up approach.

Unit-2:
Quantum Dots: Excitons and excitonic Bohr radius – difference between nanoparticles and quantum dots - Preparation throughcolloidal methods - Epitaxial methods- MOCVD and MBE growth ofquantum dots - current-voltage characteristics - magneto tunnelling measurements - spectroscopy of Quantum Dots: Absorption andemission spectra - photo luminescence spectrum - optical spectroscopy- linear and nonlinear optical spectroscopy
Unit-3:
Synthesis of Nanostructure Materials: Gas phase condensation –Vacuum deposition -Physical vapor deposition (PVD) - chemical vapour deposition (CVD) – laser ablation- Sol-Gel- Ball milling –Electrodeposition- electroless deposition – spray pyrolysis – plasma based synthesis process (PSP) - hydrothermal synthesis.
Unit-4:
Characterization: Principle and working of Atomic Force Microscopy (AFM) and Scanning tunneling microscopy (STM) - near-fieldScanning Optical Microscopy – Principle of Transmission ElectronMicroscopy (TEM) – applications to nanostructures –nanomechanical characterization – nanoindentation.
Unit-5:
Nanotechnology Applications: Applications of nanoparticles, quantum dots,nanotubes and nanowires for nanodevice fabrication –Single electron transistors, coulomb blockade effects in ultra-smallmetallic tunnel junctions - nanoparticles based solar cells and quantum dots based white LEDs – CNT based transistors – principle of dip penlithography.

- **Suggested Syllabus**

Unit-1:
Nanoscale Systems: Length, energy, and time scales – Quantum confinement of electrons in semiconductor nanostructures: Quantumconfinement in 3D, 2D, 1D and zero dimensional structures-Size effectand properties of nanostructures- Landauer-Buttiker formalism for conduction in confined geometries - Top down and Bottom up approach.
Unit-2:
Quantum Dots: Excitons and excitonic Bohr radius – difference between nanoparticles and quantum dots - Preparation throughcolloidal methods - Epitaxial methods- Chemical vapour deposition (CVD. PECVD, MOCVD) and MBE growth ofquantum dots spectroscopy of Quantum Dots: Absorption andemission spectra - photo luminescence spectrum -optical spectroscopy- linear and nonlinear optical spectroscopy
Unit-3:
Synthesis of Nanostructure Materials: Gas phase condensation –Vacuum deposition -Physical vapor deposition (PVD), Vacuum evaporation, e-beam evaporation, sputtering (DC, RF, Magnetron Sputtering) — laser ablation- Sol-Gel- Ball milling –Electrodeposition- electroless deposition – spray pyrolysis – hydrothermal synthesis.
Unit-4:
Characterization: Principle and working of Atomic Force Microscopy (AFM) and Scanning tunneling microscopy (STM) - near-fieldScanning Optical Microscopy – Principle of Transmission ElectronMicroscopy (TEM) – applications to nanostructures –

nanomechanicalcharacterization – nanoindentation., Thermal analysis: (TG-DTA study)
Unit-5:
Nanotechnology Applications: Applications of nanoparticles, quantum dots,nanotubes and nanowires for nanodevice fabrication –Single electron transistors, coulomb blockade effects in ultra-smallmetallic tunnel junctions - nanoparticles based solar cells and quantum dots based white LEDs – CNT based transistors – principle of dip penlithography.

➢ Nano-science &Technology -MPH315

Current Syllabus

Unit-1:
Introduction to Nanoparticles: Introduction; Historical perspective of nanoparticle; Classification of nanomaterials -Nanorods, Nanoparticle; Nanomaterial preparation - Plasma Arching, Chemical Vapor Deposition, Sol Gel electrode position, Ball Milling technique
Unit-2:
Characterization Tools: Electron Microscopy Techniques – SEM, TEM; X ray methods; Optical Methods Fluorescence Microscopy; Atomic Force Microscopy; STM.
Unit-3:
Nano magnetism: Mesoscopic magnetism; Magnetic measurements: Miniature Hall Detectors; Integrated DC SQUID Microsusceptometry; Magnetic recording technology; Biological Magnets.
Unit-4:
Nanoelectronics and Integrated Systems: Basics of nanoelectronics; Single Electron Transistor; Quantum Computation; Tools of micro-nanofabrication; Nanolithography; Quantum electronic devices; MEMS and NEMS; Dynamics of NEMS; Limits of integrated electronics
Unit-5:
Applications: Micromechanical systems; Robots; Ageless materials; Nano mechanics; Nano electronics; Optoelectronic devices; LED; Colorants and pigments; Nano biotechnology - DNA chips, DNA array devices, Drug delivery systems.

Suggested Syllabus

Unit-1:
Introduction to Nanoparticles: Introduction; Historical perspective of nanoparticle; Classification of nanomaterials -Nanorods, Nanoparticle; Nanomaterial preparation - Plasma Arching, Chemical Vapor Deposition, Sol Gel electrode position, Ball Milling technique
Unit-2:
Characterization Tools: Electron Microscopy Techniques: SEM, TEM; Scanning Probe Microscopy: Scanning Tunnelling

Microscopy; Atomic Force Microscopy, X ray methods: X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), Energy dispersive energy (EDX) analysis; Optical Methods UV-Visible spectroscopy, Fourier Transformed Infrared Spectroscopy (FTIR)
Unit-3:
Nano magnetism: Mesoscopic magnetism; Magnetic measurements: Miniature Hall Detectors; Integrated DC SQUID Microsusceptometry; Magnetic recording technology: Basic Principle; analogue recording, Digital Recording
Unit-4:
Nanoelectronics and Opto-electronics: Single Electron Transistor; Quantum Computation; Tools of micro-nanofabrication: Nanolithography; basics of MEMS and NEMS; LED, LDR
Unit-5:
Data Interpretation : Coating, Contact angle analysis and surface energy calculation, Particle size, stress and strain determination from XRD, Determination of optical gap, quantum confinement and defect analysis from UV-Vis spectra; Hybridization states and doping from XPS, Beyond microscopic information from electron microscopy and scanning probe microscopy.

Annexure-II

Two new open elective papers (for 3rd & 4th semesters, respectively) have suggested to be introduced in M.Sc. Physics, as following

Open Elective for 3rd Semester (Discipline Specific Elective Course-II)

Course Code: MPH	M.Sc. Physics- Semester-III Analog and Digital Systems	L-4 T-0 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding and Applying the concept of OPAMP	
CO2.	Understanding the concept of Number system	
CO3.	Applying the truth table of logic gates in different logic system.	
CO4.	Understanding the clock timer and flip-flop	
CO5.	Understanding the concept of shift registrar and D-digital-Analogue/Analogue-digital converter.	
Course Content:		
Unit-1:	Operational Amplifiers (Black box approach): Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Open and closed loop configuration, Frequency Response. CMRR. Slew Rate and concept of Virtual Ground. Applications: (1) Inverting and non-inverting amplifiers, (2) Summing and Difference Amplifier, (3) Differentiator, (4) Integrator, (5) Wein bridge oscillator,	8 Hours
Unit-2:	Number System and Codes: Decimal, Binary, Octal and Hexadecimal number systems, base conversions. Representation of signed and unsigned numbers, BCD code. Binary, octal and hexadecimal arithmetic; addition, subtraction by 2's complement method	8 Hours
Unit-3:	Logic Gates and Boolean algebra: Truth Tables of OR, AND, NOT, NOR, NAND, XOR, XNOR, Universal Gates, Basic postulates and fundamental theorems of Boolean algebra Arithmetic Circuits: Binary Addition. Half and Full Adder. Half and Full Subtractor, 4-bit binary Adder and Subtractor.	8 Hours
Unit-4:	Clock and Timer (IC 555): Introduction, Block diagram of IC 555, Astable and Monostable multivibrator circuits. Sequential Circuits: SR, D, and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race-around conditions in JK Flip-Flop.	8 Hours
Unit-5:	Shift registers: Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits). Counters (4 bits): Ring Counter. Asynchronous counters, Decade Counter. Synchronous Counter. Digital to analogue and analogue to digital conversion (Basic idea). Microprocessor and microcontroller basics.	8 Hours
Text Books:	1. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall. 2. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt.	

	Ltd	
Reference Books:	1. Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011, Oxford 2. University Press. 3. Digital Principles and Applications, A.P. Malvino, D.P. Leach and Saha, 7th Ed., 2011,Tata McGraw. 4. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill. 5. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning. 6. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994) 7. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994) *** Latest editions of all the suggested books are recommended.**	
Additional electronic reference material	1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/video-lectures/lecture-19/ 2. https://www.youtube.com/watch?v=NE_f6joxYNw	

Open Elective for 4th Semester (Discipline Specific Elective Course-III)

Course Code: MPH	**M.Sc. Physics- Semester-IV** **Photonics**	**L-4 T-0 P-0 C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Remembering** the concepts of Modern optics and photonics	
CO2.	**Understanding** the concepts of Optical processes in semiconductors and devices	
CO3.	**Understanding** the concepts of photonics devices	
CO4.	**Applying** the concepts of photonics in the nano-devices.	
CO5.	**Applying** the concept of photonics in the Bio photonics devices	
Course Content:		
Unit-1:	**MODERN OPTICS** Light, Light-material interaction, Electrodynamics: Maxwell's equations, Electromagnetic wave in different media, Polarization of light, Interference, Absorption, Dispersion and modulation of light, Fiber optics and their applications, Lasers and their applications.	**8 Hours**
Unit-2:	**OPTOELECTRONICS** Optical processes in semiconductors, Semiconductor optoelectronic Devices, Application of optoelectronic devices, Optoelectronic tweezers.	**8 Hours**
Unit-3:	**PHOTONIC MATERIALS AND DEVICES** Photonic crystals, 1D,2D, 3D photonic crystals structures, Photonic band gapes, photonic crystal optical fiber, Photonic devices: LEDs, Solar cells, photodiodes, photo detectors, photoconductors, Laser diodes, Electro-optic and Magneto-optic devices	**8 Hours**

Unit-4:	**NANOPHOTONICS** Nanophotonics and its nature, Single Electron transistors (SET), Quantum Coulomb Blockade, Stability Diagram, Tunnel diode (MIM and MIS), Band diagram, the tunneling current, Nano-fabrications: Near-field optical CVD and near field photolithography, A phototransistor, Charge coupled device.	**8 Hours**
Unit-5:	**NANO BIOPHOTONICS** Photobiology, Photosynthesis, Photo excitation, Optical fiber delivery system, Optical Biosensors, Laser activated therapy, laser surgery	**8 Hours**
Text Books:	1. NANOMATERIALS, New Age International Publishers by A. K. Bandyopadhyay.	
Reference Books:	1. SOLID STATE PHYSICS, Wiley publication by Charles Kittle. 2. PHYSICS OF SEMICONDUCTOR DEVICES, Wiley publication by S. M. Sze and Kwok K. Ng. 3. Photonics: An Introduction, Springer by Georg A. Reider *** Latest editions of all the suggested books are recommended.**	
Additional electronic reference material	1. https://www.youtube.com/watch?v=mtAcrB9JrhA 2. https://www.youtube.com/watch?v=X0t6My5e9ko	

Annexure-III

Department proposes a NEW program of semester based general B.Sc. (Physics, Mathematics, Computer Science / Statistics) of **135 maximum credits.**

Programme Educational Objectives (PEOs)

- **PEO1:** Graduates can pursue PG and Research.
- **PEO2:** Graduates are provided with domain knowledge to get employed in IT industries, Scientific & Research organizations and allied industries.
- **PEO3:** Graduates are trained to develop and demonstrate creativity and innovation equipped with Collaborative working Skills.
- **PEO4:** Graduates will develop positive attitude and life skills which enable them to become a multi facet personality with a sense of environmental consciousness and responsible citizen with moral and ethical values

Programme Outcomes (POs)

- **PO1:** Acquire knowledge in Physical Sciences with a thrust on fundamental principles and theories related to various scientific phenomena and their relevance in day-to-day life.
- **PO2:** Graduates attain practical knowledge through hands-on training and project experience to meet the industrial needs.
- **PO3:** Graduates develop critical thinking skills to identify, analyze and solve problems of their core areas using modern tools.
- **PO4:** Graduates develop lifelong learning skills with interdisciplinary approach towards sustainable development.
- **PO5:** Ability to communicate effectively the comprehended scientific data and knowledge, write effective reports, design documentation and make effective presentations.

Programme Specific Outcomes (PSOs)

- **PSO1:** Students develop problem solving skills and methods and develop logical tools in the various real life problems.
- **PSO2:** Students acquire knowledge of modern techniques of solving algebraic, differential and integral equations for the applications in the interdisciplinary sciences.
- **PSO3:** The students attain sound knowledge in the areas of Physics, Computer Science & Mathematics for pursing higher education and research.
- **PSO4:** Ability to design and develop software applications to address real time problems using Programming languages, Operating Systems, Databases, and Computer Network Concepts.

Eligibility Criteria

A pass in the two year Intermediate Examination of any boards or +2 Examinations recognized as equivalent to and with an aggregate of 50 % marks in the concerned Science subjects like Physics & Mathematics.

Study & Evaluation Scheme

B.Sc. Physics, Mathematics, Computer Science/ Statistics -Semester I

S. No	Category	Core/ Elective	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	PHY-1	*Core	Mechanics	4	0	0	4	40	60	100
2	MATH-1	*Core	Algebra & Matrices	4	0	0	4	40	60	100
3	MATH-2	*Core	Trigonometry & Differential Calculus	4	0	0	4	40	60	100
4	CS-1	**Elective-1	Computer Fundamentals & C programming	4		0	5	40	60	100
	LAB-C1		C programming Lab	0	0	2		50	50	100
	STAT-1	**Elective-1	Fundamental of Statistics	4	1	0	5	40	60	100
5	ENG-1	***AECC-1	English Communication	2	-	2	3	40	60	100
6	LAB-P1	*Core	Mechanics (Lab)	0	0	2	1	50	50	100
7	DGP-1		Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**18**	**0/1**	**6/4**	**21**	**400/350**	**400/350**	**800/700**

* ***Core competency:*** Core courses of this programme are intended to provide deep understanding and interpreting skill of physical information – verbally, mathematically and graphically. The theoretical study along with laboratory courses also provides the connection between theoretical knowledge taught in textbooks/ homework problems and the experimental foundations of this knowledge.

** ***Elective Course (EC):*** Elective courses are the choice of the B.Sc. programme has given in the first semester to VI semesters.

*** **Ability-Enhancement Compulsory Course** (AECC)

B.Sc. Physics, Mathematics, Computer Science/ Statistics -Semester II

S. No	Category	Core/ Elective	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	PHY-2	*Core	Electricity and Magnetism	4	0	0	4	40	60	100
2	PHY-3	*Core	Waves & optics	4	0	0	4	40	60	100
3	CS-2	*Elective-2	Data Structures Using C++	4	0	0	4	40	60	100
	LAB-C2		Data structures Lab	0	0	2	1	50	50	100
	STAT-2	*Elective-2	Introduction to Probability	4	1	0	5	40	60	100
4	MATH-3	*Core	Vector calculus & Geometry	4	0	0	4	40	60	100
5	MATH-4	*Core	Integral Calculus	4	0	0	4	40	60	100
6	ENV-1	***MC-1	Environmental Studies	2	1	0	3	40	60	100
7	LAB-P2	*Core	Waves & optics (Lab)	0	0	2	1	50	50	100
8	DGP-2		Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**22**	**0/1**	**4/2**	**25**	**440/390**	**460/410**	**900/800**

* ***Core competency:*** Core courses of this programme are intended to provide deep understanding and interpreting skill of physical information – verbally, mathematically and graphically. The theoretical study along with laboratory courses also provides the connection between theoretical knowledge taught in textbooks/ homework problems and the experimental foundations of this knowledge.

** ***Elective Course (EC):*** Elective courses are the choice of the B.Sc. programme has given in the first semester to VI semesters.

******Mandatory Course (MC):*** This is a compulsory course that does not have any choice and will be of 3 credits. Each student of this Program has to compulsorily pass the Environmental Studies.

B.Sc. Physics, Mathematics, Computer Science/ Statistics -Semester III

S. No	Category	Core / Elective	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	PHY-4	*Core	Elements of Modern Physics	4	0	0	4	40	60	100
2	PHY-5	*Core	Thermal Physics	4	0	0	4	40	60	100
3	CS-3	**Elective-3	Database Management System	4	0	0	4	40	60	100
	LAB-C3		Database Management System Lab	0	0	2	1	50	50	100
	STAT-3	**Elective-3	Sampling Techniques	4	1	0	5	40	60	100
4	MATH-5	*Core	Numerical Analysis	4	0	0	4	40	60	100
5	MATH-6	*Core	Ordinary Differential Equation	4	0	0	4	40	60	100
6	LAB-P3	*Core	Elements of Modern Physics Lab	0	0	2	1	50	50	100
7	LAB-M1	*Core	Numerical Analysis Lab	0	0	2	1	50	50	100
8	DGP-3		Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**20**	**0/1**	**6/4**	**23**	**450/400**	**450/400**	**900/800**

** **Core competency:*** Core courses of this programme are intended to provide deep understanding and interpreting skill of physical information – verbally, mathematically and graphically. The theoretical study along with laboratory courses also provides the connection between theoretical knowledge taught in textbooks/ homework problems and the experimental foundations of this knowledge.

*** **Elective Course (EC):*** Elective courses are the choice of the B.Sc. programme has given in the first semester to VI semesters.

B.Sc. Physics, Mathematics, Computer Science/ Statistics -Semester IV

S. No	Category	Core / Elective	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	PHY-6	*Core	Semiconductor Physics	4	0	0	4	40	60	100
2	PHY-7	*Core	Atomic & Laser Physics	4	0	0	4	40	60	100
3	CS-4	**Elective-4	Object-Oriented Programming Concepts using Java	4	0	0	4	40	60	100
	LAB-C4	**Elective-4	Object-Oriented Programming Concepts using Java Lab	0	0	2	1	50	50	100
	STAT-4	**Elective-4	Statistical Methods	4	1	0	5	40	60	100
4	MATH-7	*Core	Partial Differential Equation	4	0	0	4	40	60	100
5	MATH-8	*Core	Real Analysis	4	0	0	4	40	60	100
6	LAB-P4	*Core	Semiconductor Physics (Lab)	0	0	2	1	50	50	100
7	LAB-M2	*Core	MATLAB	0	0	2	1	50	50	100
8	DGP-4		Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**20**	**0/1**	**6/4**	**23**	**450/400**	**450/400**	**900/800**

** **Core competency:** Core courses of this programme are intended to provide deep understanding and interpreting skill of physical information – verbally, mathematically and graphically. The theoretical study along with laboratory courses also provides the connection between theoretical knowledge taught in textbooks/ homework problems and the experimental foundations of this knowledge.*

*** **Elective Course (EC):** Elective courses are the choice of the B.Sc. programme has given in the first semester to VI semesters.*

B.Sc. Physics, Mathematics, Computer Science/ Statistics -Semester V

S. No	Category	Core / Elective	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	PHY-8	*Core	Electromagnetic Theory	4	0	0	4	40	60	100
2	PHY-9	*Core	Quantum Mechanics	4	0	0	4	40	60	100
3	CS-5	**Elective-5	Digital Electronics & Computer Organization	4	0	0	4	40	60	100
	LAB-C5		Programming in PHP and MySQL Lab	0	0	2	1	50	50	100
	STAT-5	**Elective-5	Introduction to SPSS	4	0	0	4	40	60	100
	LAB-S1		SPSS Lab	0	0	2	1	50	50	100
4	MATH-9	*Core	Discrete Mathematics	4	0	0	4	40	60	100
5	MATH-10	*Core	Complex Analysis	4	0	0	4	40	60	100
6	DGP-5		Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**20**	**0**	**4**	**21**	**350**	**350**	**700**

* ***Core competency:*** Core courses of this programme are intended to provide deep understanding and interpreting skill of physical information – verbally, mathematically and graphically. The theoretical study along with laboratory courses also provides the connection between theoretical knowledge taught in textbooks/ homework problems and the experimental foundations of this knowledge.

** ***Elective Course (EC):*** Elective courses are the choice of the B.Sc. programme has given in the first semester to VI semesters.

B.Sc. Physics, Mathematics, Computer Science/ Statistics -Semester VI

S. No	Category	Core / Elective	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	PHY-10	*Core	Statistical & Classical Mechanics	4	0	0	4	40	60	100
2	PHY-11	*Core	Nuclear & Particle Physics	4	0	0	4	40	60	100
3	CS-6	**Elective-6	Introduction to web technologies	4	0	0	4	40	60	100
	LAB-C6		Web Technologies Lab	0	0	2	1	50	50	100
	STAT-6	**Elective-6	Applied Statistics	4	1	0	5	40	60	100
4	CS-7	**Elective-7	Python	4	0	0	4	40	60	100
	LAB-C7		Python Lab	0	0	2	1	50	50	100
	STAT-6	**Elective-7	Analysis of Variance & Estimation Theory	4	1	0	5	40	60	100
5	MATH-11	*Core	Operations Research	4	0	0	4	40	60	100
8	DGP-6		Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**20**	**0/2**	**4/0**	**22**	**400/ 300**	**400/ 300**	**800/ 600**

** **Core competency:*** Core courses of this programme are intended to provide deep understanding and interpreting skill of physical information – verbally, mathematically and graphically. The theoretical study along with laboratory courses also provides the connection between theoretical knowledge taught in textbooks/ homework problems and the experimental foundations of this knowledge.

*** **Elective Course (EC):*** Elective courses are the choice of the B.Sc. programme has given in the first semester to VI semesters.

Minutes of the Meeting

BOARD OF STUDIES (BOS)

Department of Mechanical Engineering

Date: 4 December, 2021

Venue: Director Office/Online, FOE, TMU

Faculty of Engineering

Teerthanker Mahaveer University

Moradabad

www.tmu.ac.in

Teerthanker Mahaveer University, Moradabad

Faculty of Engineering

Department of Mechanical Engineering,

Minutes of Meeting "Board of Studies"

Dated: 04 December 2021

A meeting of Board of Studies has been held in Director's office, Faculty of Engineering on 04/12/2021. Following points have been discussed regarding revision in syllabus and scheme for existing B.Tech. (Mechanical Engineering) program, batch 2021-22. Following members were present in meeting:

1. Prof R.K Dwivedi, Director FoE
2. Prof. Lokesh Varshney Dept.of ME, G.B.Pant University Pantnagar (External Expert)
3. Prof. M. Zameel Ahmad Dept.of ME, AMU Aligarh (External Expert)
4. Mr. Harish Kumar, CoD, Dept. of Mechanical Engg.
5. Mr. K.B. Anand, Dept. of Mechanical Engg.
6. Dr. Rohit Kumar Singh Gautam, Dept. of Mechanical Engg.
7. Mr. Himansh Kumar , Dept. of Mechanical Engg.

The following points were discussed in BoS:

1. Implementation and mapping of TCS Syllabus of B.Tech Program Mechanical Engineering with Specialization in Mechatronics session 2021-22.(Attached as Annexure -I)
   TCS-Ion offered course

Sem.	Subject Name	Replaced by
II	Business English	English Communication -I
III	Design Thinking	Operation Research
IV	CAD for 3D Design	English Communication -III
V	Design For Additive Manufacturing	Energy Conservation
VI	Industrial Mechatronics System	Non Conventional Energy Resources
VII	Robotics for Real world Applications	Power Plant Engineering(Program Elective)

Expert Suggestions

i. Map power Plant Engineering (EME713) Course as a core subject from elective .
ii. Remove the Course Computer Aided Design (EME711) From 7th Semester. Syllabus of Computer Aided Design (EME711) is same as CAD for 3D Design (TCS-Ion). So there is no need to study Computer Aided Design (EME711) again.
iii. One Energy related course should be added.
iv. Course Non conventional Energy Resources (EE614) should be added as a course of Mechanical Engineering.
v. Shift the Course Automobile Engineering (EME514) from core to Program Elective.
vi. Hydraulic Machine (EME714) should be added as a program elective -II in 7th sem.
vii. All above points are attached in Annexure-I

2. Total all courses in all semesters should be included with GP marks from 2019-20 onwards.
3. Syllabus should be as per IES syllabus.
4. BOS recommended the name of the subject "Non Conventional Energy Resources" (EE614) replaced by the name "Renewable energy resources". and will be effective from session 2021-22 in 6th semester (Annexure-I).
5. BOS recommended some changes in EME515 Energy Conservation in semester 7th as programme Elective replaced from semester 5th for batch 2021-22. (Annexure-I).

Meeting ended with a vote of Thanks.

Annexure-I
Study & Evaluation Scheme

B.Tech Mechanical Engineering - Semester I

S. No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	BSC-1	EAS116	Engineering Mathematics-I	3	1	-	4	40	60	100
2	BSC-2	EAS112	Engineering Physics	3	1	-	4	40	60	100
		EAS113	Engineering Chemistry							
3	ESC-1	EEE117	Basic Electrical Engineering	3	1	-	4	40	60	100
		EEC111	Basic Electronics Engineering							
4	MC-1	TMU101	Environmental Studies	2	1	-	3	40	60	100
5	HSMC-1	TMUGE101	English Communication- I	2	-	2	3	40	60	100
6	LC-1	EAS162	Engineering Physics (Lab)	-	-	2	1	50	50	100
		EAS163	Engineering Chemistry (Lab)							
7	LC-2	EEE161	Basic Electrical Engineering (Lab)	-	-	2	1	50	50	100
		EEC161	Basic Electronics Engineering (Lab)							
8	LC-3	EME161	Engineering Drawing (Lab)	-	-	4	2	50	50	100
		EME162	Workshop Practice (Lab)							
9	DGP-1	EGP111	Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**13**	**4**	**10**	**22**	**350**	**450**	**800**

B.Tech Mechanical Engineering-Semester II

S. No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	BSC-3	EAS211	Engineering Mathematics-II	3	1	-	4	40	60	100
2	BSC-4	EAS212	Engineering Physics	3	1	-	4	40	60	100
		EAS213	Engineering Chemistry							
3	ESC-2	EEE217	Basic Electrical Engineering	3	1	-	4	40	60	100
		EEC211	Basic Electronics Engineering							
4	ESC-3	ECS212	Computer System &Programming inC++	3	-	-	3	40	60	100
5	SP-1	ETS-201	Business English	3			3	40/50	60/50	100
6	LC-4	EAS262	Engineering Physics (Lab)	-	-	2	1	50	50	100
		EAS263	Engineering Chemistry (Lab)							
7	LC-5	EEE261	Basic Electrical Engineering (Lab)	-	-	2	1	50	50	100
		EEC261	Basic Electronics Engineering (Lab)							
8	LC-6	ECS262	Computer System &Programming in C++ (Lab)	-	-	2	1	50	50	100
9	LC-7	EME261	Engineering Drawing (Lab)	-	-	4	2	50	50	100
		EME262	Workshop Practice (Lab)							
10	DGP-2	EGP211	Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**15**	**3**	**10**	**23**	**400/410**	**500/490**	**900**

B.Tech Mechanical Engineering-Semester III

S. No	Category	Course Code	Course	Periods			Evaluation Scheme			
				L	T	P	Credit	Internal	External	Total
1	PCC-1	EME311	Engineering Mechanics	3	1	-	4	40	60	100
2	PCC-2	EME312	Engineering Thermodynamics	3	1	-	4	40	60	100
3	PCC-3	EME313	Material Science	3	1	-	4	40	60	100
4	PCC-4	EME314	Industrial Engineering	3	-	-	3	40	60	100
5	SP-2	ETS-301	Design Thinking	3	1	1	5	40/50	60/50	100
6	LC-8	EME361	Machine Drawing (Lab)	-	-	2	1	50	50	100
7	LC-9	EME362	Engineering Thermodynamics (Lab)	-	-	2	1	50	50	100
8	LC-10	EME363	Material Science (Lab)	-	-	2	1	50	50	100
9	DGP-3	EGP311	Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**15**	**4**	**7**	**23**	**450/460**	**450/440**	**900**

Following additional Course for Lateral Entry Students with B.Sc./Polytechnic background to be taken in III semester and all should pass with minimum of 45% marks for obtaining the degree: credits will not be added

1	LC	EME161/261	Engineering Drawing (Lab)	-	-	4	-	50	50	100
2		TMU101	Environmental Studies	2	1	-	-	40	60	100

Value AddedCourse:
It is an audit course. The performance of the student in this course will not be counted in the overall result however the student has to pass it compulsorily with 45% marks.

1	VAC-1	TMUGA-301	Foundation in Quantitative Aptitude	2	1	-	-	40	60	100

B.Tech Mechanical Engineering-Semester IV

S. No	Category	Course Code	Course	Periods			Evaluation Scheme			
				L	T	P	Credit	Internal	External	Total
1	PCC-5	EME411	Strength of Materials	3	1	-	4	40	60	100
2	PCC-6	EME412	Production Technology – I	3	1	-	4	40	60	100
3	PCC-7	EME413	Measurement, Metrology & Control	3	1	-	4	40	60	100
4	PCC-8	EME414	Fluid Mechanics	3	-	-	3	40	60	100
5	SP-3	ETS-401	CAD for 3D Design	3	1	1	5	40/50	60/50	100
6	LC-11	EME461	Production Technology-I (Lab)	-	-	2	1	50	50	100
7	LC-12	EME462	Measurement, Metrology & Control (Lab)	-	-	2	1	50	50	100
8	LC-13	EME463	Fluid Mechanics (Lab)	-	-	2	1	50	50	100
9	DGP-4	EGP411	Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**15**	**4**	**7**	**23**	**450/460**	**450/440**	**900**

*Skill based Training/Internship of 4 weeks duration from a reputed Industry/organization after completion of 4th semester end-semester examination.

Following additional Courses for Lateral Entry Students with B.Sc./Polytechnic background to be taken in IV semester and all should pass with minimum of 45% marks for obtaining the degree: credits will not be added

1	LC	EME162/262	Workshop Practice (Lab)	-	-	4	-	50	50	100

***Value Added Course:**

1	VAC-2	TMUGA-401	Analytical Reasoning	2	1	-	-	40	60	100

B.Tech Mechanical Engineering-Semester V

S. No	Category	Course Code	Course	Periods			Evaluation Scheme			
				L	T	P	Credit	Internal	External	Total
1	PCC-9	EME511	Production Technology –II	3	1	-	4	40	60	100
2	PCC-10	EME512	Dynamics of Machines	3	-	-	3	40	60	100
3	PCC-11	EME513	Heat & Mass Transfer	3	-	-	3	40	60	100
4	PCC-12	EME515	Power Plant Engineering	3	-	-	3	40	60	100
5	SP-4	ETS-501	Design for Additive Manufacturing	3	1	1	5	40/50	60/50	100
6	HSMC-4	EHM513	Human values & Professional Ethics	2	-	-	2	40	60	100
7	LC-14	EME561	Production Technology-II (Lab)	-	-	2	1	50	50	100
8	LC-15	EME562	Dynamics of Machines (Lab)	-	-	2	1	50	50	100
9	LC-16	EME563	Heat & Mass Transfer (Lab)	-	-	2	1	50	50	100
10	PROJ-1	EME592	Skill based Practical Training & Presentation	-	-	-	2	50	50	100
11	DGP-5	EGP511	Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**17**	**2**	**7**	**25**	**540/550**	**560/550**	**1100**

***Value Added Course:**

1	VAC-3	TMUGA-501	Modern Algebra and Data Management	2	1	-	-	40	60	100
2	VAC-4	TMUGS-501	Managing Self	2	1	-	-	50	50	100

MOOC Course:

1	MOOC-I	MOOC01	MOOC Program -I (Optional)	-	-	-	2	-	100	100

B.Tech Mechanical Engineering-Semester VI

S. No	Category	Course Code	Course	Periods			Evaluation Scheme			
				L	T	P	Credit	Internal	External	Total
1	PCC-13	EME611	Refrigeration & Air Conditioning	3	1	-	4	40	60	100
2	PCC-14	EME612	Mechanical Vibrations	3	-	-	3	40	60	100
3	PCC-15	EME613	Design of Machine Elements	3	-	-	3	40	60	100
4	PCC-16	EME 614	Renewable Energy Resources	3	1		4	40	60	100
5	SP-5	ETS-601	Industrial Mechatronics System	3	1	1	5	40/50	60/50	100
6	ESC-6	EHM611	Operations Management	3	-	-	3	40	60	100
7	HSMC-5	TMUGE601	English Communication- IV	2	-	2	3	40	60	100
8	LC-17	EME661	Refrigeration & Air Conditioning (Lab)	-	-	2	1	50	50	100
9	LC-18	EME662	Solid Works (Lab)	-	-	2	1	50	50	100
10	DGP-6	EGP611	Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**17**	**2**	**7**	**23**	**440/450**	**460/450**	**900**

*Industrial Training of 6 weeks duration from a reputed Industry/organization after completion of 6th semester end-semester examination.

***Value Added Course:**

1	VAC-5	TMUGA-601	Advance Algebra and Geometry	2	1	-	-	40	60	100
2	VAC-6	TMUGS-601	Managing Work and Others	2	1	-	-	50	50	100

MOOC Course:

1	MOOC-2	MOOC02	MOOC Program –II (Optional)	-	-	-	2	-	100	100

B.Tech Mechanical Engineering-Semester VII

S. No.	Category	Course Code	Course		Periods			Evaluation Scheme			
					L	T	P	Credit	Internal	External	Total
1	PCC-16	EME712	IC Engines		3	-	-	3	40	60	100
3	SP-6	ETS-701	Robotics for Real World Applications		3	1	1	5	40/50	60/50	100
4	PEC-1		Program Elective	Program Elective-I	3	1	-	4	40	60	100
5	PEC-2			Program Elective-II	3	1	-	4	40	60	100
6	OEC-1		Open Elective	Open Elective-I	3	-	-	3	40/50	60/50	100
7	LC-19	EME761	Computer Aided Design (Lab)		-	-	2	1	50	50	100
8	LC-20	EME762	IC Engines (Lab)		-	-	2	1	50	50	100
9	PROJ-2	EME792	Industrial Training & Presentation		-	-	-	2	50	50	100
10	PROJ-3	EME798	Project Work Phase-1		-	-	10	5	100	-	100
11	DGP-7	EGP711	Discipline & General Proficiency		-	-	-	-	100	-	100
			Total		**15**	**2**	**15**	**27**	**550/570**	**450/430**	**1000**

MOOC Course:

1	MOOC-3	MOOC03	MOOC Program –III (Optional)	-	-	-	2	-	100	100

B.Tech Mechanical Engineering-Semester VIII

S. No	Category	Course Code	Course		Periods			Evaluation Scheme			
					L	T	P	Credit	Internal	External	Total
1	PCC-17	EME811	Computer Aided Manufacturing (CAM)		3	1	-	4	40	60	100
2	PEC-3		Program Elective	Program Elective-III	3	1	-	4	40	60	100
3	PEC-4			Program Elective-IV	3	1	-	4	40	60	100
4	PEC-5		Program Elective (Lab)	Program Elective-V	-	-	2	1	50	50	100
5	OEC-2		Open	Open Elective-II	3	-	-	3	40/50	60/50	100
6	LC-21	EME861	Computer Aided Manufacturing (CAM) (Lab)		-	-	2	1	50	50	100
7	PROJ-4	EME898	Project Work Phase –II		-	-	6	3	50	50	100
8	DGP-8	EGP811	Discipline & General Proficiency		-	-	-	-	100	-	100
			Total		**12**	**3**	**10**	**20**	**310/320**	**390/380**	**700**

MOOC Course:

1	MOOC-4	MOOC04	MOOC Program –IV (Optional)	-	-	-	2	-	100	100

ELECTIVE COURSES OFFERED

S.No	Code	Course	L	T	P	Credit
Semester VII- Program Elective I (Any one)						
1	EME716	Automobile Engineering	3	1	0	4
2	EME717	Energy Conservation	3	1	0	4
3	EME715	Gas Dynamics	3	1	0	4
Semester VII- Program Elective II (Any one)						
4	EME714	Hydraulic Machines	3	1	0	4
4	EHM735	Industrial Sociology	3	1	0	4
5	EHM736	Principles of Management and Organizational Behaviour	3	1	0	4
6	EHM734	Engineering and Managerial Economics	3	1	0	4
Semester VIII- Program Elective III(Advanced Manufacturing Systems) (Any one)						
7	EME812	Unconventional Manufacturing Process	3	1	0	4
8	EME813	Mechatronics	3	1	0	4
Semester VIII- Program Elective IV(Product development and Quality control) (Any one)						
9	EME814	Product Design and Value Engineering	3	1	0	4
10	EHM832	Total Quality Management	3	1	0	4
11	EME816	Maintenance Engineering	3	1	0	4
Semester VIII- Program Elective V(Advanced Manufacturing systems Labs) (Any one)						
12	EME862	Unconventional Manufacturing Process (Lab)	0	0	2	1
13	EME863	Mechatronics (Lab)	0	0	2	1