Framework for 4 years UG (B.Tech. – Computer Science & Engineering) Programme under NEP-2020 based on AICTE 2023 Model Curriculum Guidelines

1. Implementation of Four Year UG Engineering Curriculum in First Phase with effect from Academic Year **2025-26:**
   The credit and Multidisciplinary Curricular Framework, designed on the lines of the National Credit Framework and AICTE Approval Process Handbook, is to be made applicable to in first phase to the AICTE-regulated UG (B.E./B. Tech. or equivalent) Engineering/ Technology Programs conducted in NIAMT, Ranchi with effect from Academic Year **2025-26.**

2. Credit Framework under Four-Year UG Engineering Programme with Multiple Entry and Multiple Exit options:
   The Four-year Bachelor's Multidisciplinary Engineering Degree Programme allows the students to experience the full range of holistic and multidisciplinary education in addition to a focus on the chosen major and minors as per their choices and the feasibility of exploring learning in different institutions. The minimum and maximum credit structure for different levels under the Four-year Bachelor's Multidisciplinary Engineering UG Programme with multiple entry and multiple exit options are as given below:

Semester wise Credit distribution Structure for Four Year UG Engineering Program: One Major and One Minor/Honors

Sl. No.	Year	Credit Point	
		ODD	EVEN
1	First	21	22
2	Second	20	20
3	Third	21	20
4	Fourth	20	16
Total Credit Point		**82**	**78**
		160	

Distribution of Credits

CourseCategory	Number of Subjects	As per AICTE Recom.	Proposed Credit Point
Humanities, Social Science, and Management Courses	04	12	**12**
Basic Science Course (BSC)	08	29	**25**
Engineering Science Course (ESC)	08	27	**26**
Professional Core Course (PCC)	18	58	**59**
Professional Elective Course (PEC)	04	9	**13**
Open Elective Course (OEC)	03	9	**09**
Project work, Seminar, and Internship in industry or elsewhere (PrSI)	04	16	**10+02+04=16**
Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition] (AUC)	03	(non-credit)	**00**
TotalCreditPoint			**160**
Minor Courses	04 - 05	18 - 20	**18-20**
Honors Courses	05	20	**20**

HUMANITIES & SOCIAL SCIENCES COURSES [HS] & MANAGEMENT COURSES

(2 compulsory + 2 others)

(i) Number of Humanities & Social Science Courses:4
(ii) Credits:12

Sl.	Code No.	Subject	Semester	Credits
1	HSMC 01	Communication Skills / English (Compulsory	2	2:0:2=3
2	HSMC 02	Universal Human Values-2 (Compulsory course)	2	2:1:0=3
3	HSMC 03	Industrial Psychology	5 / 6	3:0:0=3
4	HSMC 04	Operations Research	5 / 6	3:0:0=3
5	HSMC 05	Project Management	5 / 6	3:0:0=3
6	HSMC 06	Finance & Accounting / Engineering Economics	5 / 6	3:0:0=3
			Total Credits:	**12**

BASIC SCIENCE COURSE [BSC] (Total 8)

Sl.	Code No.	Subject	Semester	Credits
1	BSC 102	Engineering Chemistry	1	3:1:2=4
2	BSC 101	Engineering Mathematics-1	1	3:1:0=4
3	BSC 204	Engineering Physics	2	3:0:2=4
4	BSC 203	Engineering Mathematics-2	2	3:1:0=4
5	BSC 305	Engineering Mathematics-3	3	3:1:0=4
6	BSC 408	Engineering Mathematics-4 (Numerical Methods and Computational Techniques)	4	2:1:0=3
7	BSC 306	Biology for Engineers	3	2:0:0=2
8	BSC 307	Environmental Science (Audit)	3	2:0:0=0
			Total Credits:	**25**

ENGINEERING SCIENCE COURSE [ESC] (Total 8)

Sl.	Code No.	Subject	Semester	Credits
1	ESC 205	Basic Electrical Engineering	1	2:1:2=4
2	ESC 102	Engineering Drawing and Computer Graphics	1	1:0:4=3
3	ESC 104	Design Thinking + Idea Lab (Audit)	1	0:0:2=1
4	ESC 101	Programming for Problem Solving	2	2:0:4=4
5	ESC 203	Manufacturing Practice Workshop I	2	0:0:4=2
6	ESC 307	Basic Electronic Engineering	3	3:0:2=4
7	ESC 206	Engineering Mechanics	3	3:1:0=4
8	ESC 308	Digital Logic Design	3	3:1:0=4
			Total Credits:	**26**

Guidelines for minor/major Degree to be awarded by the Institute:

1. Selecting a particular "Specialization track" by studying subjects of specialization in the form of elective subjects; "Specialization#1" to "Specialization#5 in semesters 4, 5, 6, and 7.
2. B.Tech. Minor (M) and Honors (H) programmes by earning extra credits 18-20 through subjects "(M/H#1)" to "(M/H#5/5)" in semesters 4 to 8.
3. If a student successfully completes (i) Specialization track, (ii) Minor, or (iii) Honors, the UG degree will be awarded accordingly.
4. At present the specialization and Honors will be offered by the respective departments to the students of own disciplines, whereas the Minor will be offered to the students of other departments.
5. There shall be one division for a particular Minor or Honors programme with minimum of 15 students and maximum number of 75 students. The selection of students for specialization track, Minor or Honors programmes is based on CGPA upto 3rd semester as a merit criterion without any backlog and 'FF' grade.
6. For the students who are opting for specialization track and Minor/Honors programmes, the CGPA of 7.0 should be maintained in the subjects of the respective specialization track or Minor/Honor program and there should not be 'FF' grade in any subject of specialization track, otherwise Minor/Honor will not be awarded.

Course Scheme of B.Tech. (Computer Science & Engineering)

SEMESTER–I

Sl. No.	Course Code	Course Name	Credits		L	T	P	C
0.		**Induction Program (3 Weeks)**						
1	05 BSC 101	Engineering Mathematics-I	3+1	4	3	1	0	4
2	05 BSC 102	Engineering Chemistry	3+1	4	3	0	2	4
3	05 ESC 101	Programming for Problem Solving	3+1	4	3	0	2	4
4	05 ESC 102	Engineering Drawing and Computer Graphics	1+2	3	1	0	4	3
5	05 ESC 103	Workshop Practice 1	2	2	0	0	4	2
6	05 ESC 104	Design Thinking & Idea Lab	1	1	0	0	2	1
7	05 PCC 101	Fundamental of Computer Science	3	3	3	0	0	3
8	05 AUC 101	Sports & Yoga or NSS/NCC (Audit)	0	0	0	0	2	0
	Total							**21**

SEMESTER–II

Sl. No.	Course Code	Course Name	Credits		L	T	P	C
1	05 HSMC 201	Communication Skills	2+1	3	2	0	2	3
2	05 BSC 203	Engineering Mathematics -II	3+1	4	3	1	0	4
3	05 BSC 204	Engineering Physics	3+1	4	3	0	2	4
4	05 ESC 205	Basics of Electrical Engineering	3+1	4	3	0	2	4
5	05 ESC 206	Engineering Mechanics	3+1	4	3	1	0	4
6	05 PCC 202	Data Structures	3	3	2	0	2	3
7	05 AUC 202	Sports & Yoga or NSS/NCC (Audit)	0	0	0	0	2	0
(Optional) Mandatory for exit with UG certificate		Vocational / Industrial Training /Laboratory Work/ Specialized course offered by respective department	4	4	8hrs/day for 4 weeks/ 4 credit course			4
	Total							**22/26**

NOTE: Mandatory Vocational / Industrial Training (4 Weeks) OR Laboratory Work/ Specialized course offered by respective department for student opting for exit after first year with UG certificate

SEMESTER–III

Sl. No.	Course Code	Course Name	Credits		L	T	P	C
1	05 BSC 305	Engineering Mathematics-III	3+1	4	3	1	0	4
2	05 BSC 306	Biology for Engineers (MOOCs)	2	2	2	0	0	2
3	05 BSC 307	Environmental Science	0	0	2	0	0	0
4	05 ESC 307	Basics Electronics Engineering	3+1	4	3	0	2	4
5	05 ESC 308	Digital Logic Design	3+1	4	3	1	0	4
6	05 PCC 303	Object Oriented Programming using C++/Java	3	3	2	0	2	3
7	05 HSMC 302	Universal Human Values-2	2+1	3	2	1	0	3
	Total							**20**

SEMESTER–IV

Sl.No.	Course Code	Course Name	Credits		L	T	P	C
1	05 BSC 408	Numerical Methods and Computational Techniques	3	**3**	3	0	0	3
2	05 PCC 404	Design & Analysis of Algorithms	3+1	3	3	0	2	4
3	05 PCC 405	Analog Circuit	3+1	4	3	0	2	4
4	05 PCC 406	Formal Languages and Automata Theory	3	3	3	0	0	3
5	05 PCC 407	Discrete Structures	3	3	3	0	0	3
6	05 PCC 408	Software Engineering	3	3	3	0	0	3
7	05 AUC 403	Indian Knowledge System	0	0	2	0	0	0
(Optional) Mandatory for exit with UG Diploma certificate		Vocational / Industrial Training /Laboratory Work/ Specialized course offered by respective department	4	4	8hrs/day for 4 weeks/ 4 credit course			4
	Total							**20/ 24**
	05 M 401/H 401	**Minor / Honors Course**	**4/4**	**4/4**	**-**	**-**	**-**	**4/4**

NOTE: Mandatory Vocational / Industrial Training (4 Weeks) OR Laboratory Work/ Specialized course offered by respective departments for student opting for exit after 2nd year with UG Diploma Certificate.

SEMESTER–V

Sl.No.	Course Code	Course Name	Credits		L	T	P	C
1	05 PCC 509	Operating Systems	3+1	4	3	0	2	4
2	05 PCC 510	Computer Organization & Architecture	3+1	3	3	0	2	4
3	05 PCC 511	Compiler Design	3	3	3	0	0	3
4	05 PCC 512	Modelling and Optimization Techniques	2	2	2	0	0	2
5	05 PEC 501	Introduction of Artificial Intelligence & Machine Learning	3	3	3	0	0	3
6	05 HSMC 503	Operations Research	2+1	3	2	1	0	3
7	05 PrSI 501	**Summer Internship / Industrial Training	2	2	8hrs/day For 4 weeks			2
	Total							**21**
	05 M 502/**H 5**02	**Minor / Honors Course**	4/4	4/4	-	-	-	4/4

** students have to do summer internship in summer vacation (after 4thsem) and evaluation of the same will be done in 5th semester

SEMESTER–VI

Sl. No.	Course Code	Course Name	Credits		L	T	P	C
1	05 PCC 613	Microprocessor & Microcontroller	3	3	3	0	0	3
2	05 PCC 614	Industrial Automation with Internet-of-Things	3	3	3	0	0	3
3	05 PCC 615	Database Management Systems	3+1	4	3	0	2	4
4	05 PEC 602	Computer Networks	3+1	4	3	1	0	4
5	05 OEC 601	Open Elective (Another department may opt)	3	3	3	0	0	3
6	05 HSMC 604	Project Management	3	3	2	1	0	3
(Optional) Mandatory for exit with BSc Engineering		Vocational / Industrial Training /Laboratory Work/ Specialized course offered by respective department	4	4	8hrs/day for 4 weeks/ 4 credit course			4
	Total							**20/ 24**
	05 M 603/**H 6**03	**Minor / Honors Course**	3/4	34	-	-	-	3/4

NOTE: Mandatory Vocational / Industrial Training (4 Weeks) OR Laboratory Work/ Specialized course offered by respective department for student opting for exit after 3rd year with BSc Engineering

SEMESTER–VII

Sl. No.	Course Code	Course Name	Credits		L	T	P	C
1	05 PCC 716	Cryptography & Network Security	3	3	3	0	0	3
2	05 PCC 717	Internet & Web Technology	3+1	4	3	0	2	4
3	05 PCC 718	System Programming	3	3	2	0	2	3
4	05 PEC 703	Digital Image Processing / MOOCs	3	3	3	0	0	3
5	05 OEC 702	Open Elective (Another department may opt /MOOCs)	3	3	3	0	0	3
6	05 PrSI 702	Colloquium/Seminar	2	2	0	0	4	2
7	05 PrSI 703	**Summer Internship / Industrial Training	2	2	8hrs/day For 4 weeks			2
	Total							**20**
	05 M 704/**H** 704	**Minor / Honors Course**	3/4	3/4	-	-	-	3/4

** students have to do summer internship in summer vacation (after 6thsem) and evaluation of the same will be done in 7th semester

SEMESTER–VIII

Sl. No.	Course Code	Course Name	Credits		L	T	P	C
1	05 PEC 804	Introduction of Blockchain Technology and Applications (Swayam/NPTEL)	3	3	3	0	0	3
2	05 OEC 803	MOOCs (OpenElective-3)	3	3	3	0	0	3
3	05 PrSI 804	Research Project/ Dissertation-II	10	10	-	-	-	10
	Total							**16**
	05 M 805/**H 8**05	**Minor / Honors Course**	3/4	3/4	-	-	-	3/4

NOTE: MOOC's courses approved by Department will be studied by the students.

xx will be the department code from where courses are offered.

1. Department of Foundry and Forge technology, **xx-01**
2. Department of Mechanical and Manufacturing Engineering, **xx-02**
3. Department of Materials and Metallurgical Engineering, **xx -03**
4. Department of applied science and Humanities, **xx - 04**
5. Department of Computer and Electronics Engineering, **xx -05**

Multiple Entry and Exit after 1st ,2nd , 3rd and 4th year

UG	Program Level	Minimum Credit earned	Exit- Equivalence forwarding degree	Entry–Requirement (UG7 years – Credit Expiry)
UG 1st year	5	40	UG-Certificate	1.12th and JEE (through JoSAA/CSAB)
UG 2nd year	6	40	UG-Diploma	1. 12th and JEE Qualified 2. 1st year UG- Certificate 3. Screening based on Branch Specific Prerequisite (Written test)
UG 3rd year	7	42	B.Sc. Engineering	1. 12th and JEE Qualified 2. 2nd year UG- Diploma Certificate 3. Screening based on Branch. Specific Prerequisite (Written test)

*The students of Department of ECE may also have to choose a subject offered by another department as open elective.

1. Professional Elective (PCEs)

1) Introduction of Artificial Intelligence & Machine Learning
2) Computer Networks
3) Digital Image Processing
4) Introduction to Blockchain Technology & Applications

2. List of Open Elective Subjects (OECs)

2.1 Group 1 (OEC 01)

1. Fundamental Power System
2. Wireless Sensor Networks
3. Pattern Recognition
4. Software project Management
5. Distributed Operating Systems
6. System Software and Administration
7. Intellectual property rights
8. Advanced Manufacturing Technology
9. Computer Vision and Image Processing
10. Big Data Analytics
11. Industrial Automation & Robotics
12. Electronics & Industrial Instrumentation
13. Mechatronics
14. Digital Instrumentation

2.2 Group 2 (OEC 02)

1. Introduction of Cloud Computing
2. Metrology and Computer aided Inspection
3. Edge Computing
4. Advanced Operating Systems
5. Additive Manufacturing
6. Soft Computing
7. 3D Printing
8. Advanced Computer Architecture
9. Advanced Data Structures & Algorithms
10. Formal Methods in Software Engineering

2.3 Group 3 (OEC 03)

1. Automation in Manufacturing
2. Smart Machines
3. Digital Manufacturing
4. Smart Grid Technology

5. Electric Energy Generation & Control
6. Introduction to Industry 5.0
7. Virtualization & Cloud Computing
8. Information Retrieval
9. Intrusion Detection Systems
10. Software Reliability Techniques
11. Cyber Law & IPR

Internship

- Summer Internship - I: Student will go for internship during summer vacation (after 4th semester) for a period of 4 weeks. The assessment will be done on 5th semester.
- Summer Internship - II: Student will go for internship during summer vacation (after 6th semester) for a period of 4 weeks. The assessment will be done on 7th semester.

Minor Program

Minor 1 – Machine Learning and Data Science

Minor 2 – Integrated Chip Design

Minor 3 – IoT & Cyber Physical Systems

Minor 4 – Robotics & Automation

Minor 1 (Machine Learning and Data Science)						
S. No.	**Course Code**	**Course Name**	**Credits**			
			L	**T**	**P**	**C**
1	M 401	Fundamentals of Python	3	0	2	4
2	M 502	Fundamentals of Data Science	3	0	2	4
3	M 603	Data Mining and Data Warehousing	3	0	2	4
4	M 704	Machine Learning	3	0	0	3
5	M 805	Social Media Analytics	3	0	0	3
	Total					**18**

Minor 2 (Integrated Chip Design)						
S. No.	**Course Code**	**Course Name**	**Credits**			
			L	**T**	**P**	**C**
1	M 401	Digital Electronics	3	0	2	4
2	M 502	Microprocessor	3	0	2	4
3	M 603	Semiconductor devices and Circuits	3	0	2	4
4	M 704	Digital Instrumentation	3	0	0	3
5	M 805	Embedded System Design	3	0	0	3

	Total				**18**

Minor 3 (IoT & Cyber Physical System)						
S. No.	**Course Code**	**Course Name**	**Credits**			
			L	**T**	**P**	**C**
1	M 401	Computer Networks	3	0	2	4
2	M 502	Cloud & Edge Computing	3	1	0	4
3	M 603	Introduction to Internet of Things	3	0	2	4
4	M 704	Foundations of Cyber Physical System	3	0	0	3
5	M 805	Network Security	3	0	0	3
	Total					**18**

Minor 4 (Robotics & Automation)						
S. No.	**Course Code**	**Course Name**	**Credits**			
			L	**T**	**P**	**C**
1	M 401	Mechatronics	3	0	2	4
2	M 502	Industrial Automation and Robotics	3	0	2	4
3	M 603	Computer Integrated Manufacturing	3	0	2	4
4	M 704	Additive Manufacturing	3	0	0	3
5	M 805	Automation in Manufacturing	3	0	0	3
	Total					**18**

Honors program

Honors Course						
S. No.	**Course Code**	**Course Name**	**Credits**			
			L	**T**	**P**	**C**
1	H 401	Formal Methods in Computer Science	3	1	0	4
2	H 502	VLSI Design for Parallel Architectures	3	0	2	4
3	H 603	High Performance Computer Architecture	3	0	2	4
4	H 704	Recommender Systems	3	1	0	4
5	H 805	Deep Learning	3	0	2	4
	Total					**20**