MIT Art, Design & Technology University, Pune

MIT-ADT UNIVERSITY
PUNE, INDIA
A Leap Towards World Class Education
Approved bu Govt. of Maharashtra
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# NEP 2020 HANDBOOK

## MIT School of Bioengineering Sciences & Research

NEP 2020

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MIT-ADT UNIVERSITY
PUNE, INDIA
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# School of Bioengineering Sciences & Research

## Programme Structure of Bachelor of Technology and Integrated Masters of Technology (Bioengineering)

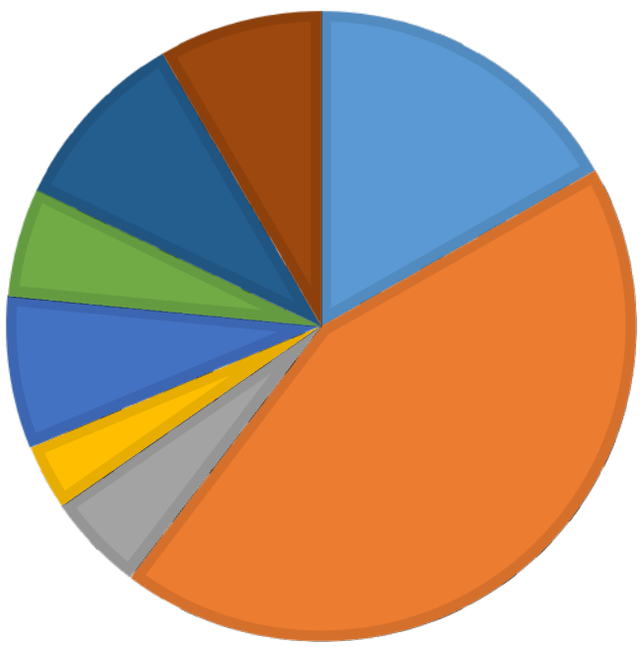
# Distribution of Category / Type of Courses and credits across Four year B.Tech Programme in Bioengineering

| Category / Type of Courses | | Semester wise Credits | | | | | | | | Course wise Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI | VII | VIII | |
| BSC/ESC | Basic Science Courses | 12 | 3 | | | | | | | 15 |
| | Engineering Science Courses | 6 | 3 | 6 | | | | | | 15 |
| Program Courses | Programme Core Course (PCC) | | 9 | 12 | 15 | 15 | 15 | 12 | | 78 |
| | Programme Elective Course (PEC) | | | | 3 | 3 | 3 | | | 9 |
| | | | | | | | | | | |
| Multidisciplinary Courses | Multidisciplinary Minor (MDM) | | | 3 | 3 | 3 | 3 | 2 | | 14 |
| | Open /Generic Electives (OE/GE) *(other than a particular program)* | | | | 3 | | 3 | | | 6 |
| | | | | | | | | | | |
| Skill Courses | Vocational and Skill Enhancement Courses | | | | | 2 | 2 | 2 | | 6 |
| | Skill Enhancement Courses (VSEC) | | | 2 | 2 | | | | | 4 |
| MD Holistic Development Courses-Humanities, Social Science and Management (HSSM)+Liberal Learning(LL) | Ability Enhancement courses (AEC) | 2 | 1 | 2 | 2 | | | | | 7 |
| | Indian Knowledge System (IKS) | | 2 | | | | | | | 2 |
| | Value Education/Value Addition/Professional | | 2 | | | | | | | 2 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Ethics/Life skills Courses (VEC/VAC/EVLSC) | | | | | | | | | |
| | Co-curricular Courses (CC) | | | 2 | | | | | | 2 |
| | Entrepreneurship/Economics/Management Courses | | | | | | | 2 | | 2 |
| | | | | | | | | | | |
| Experiential Learning Courses | Research Methodology | | | | | | | | | |
| | Mini Projects/Field Project (MP/FP) | | | | | | | | | |
| | Project | | | | | | | 2 | | 2 |
| | Internship | | | | | | | | 15 | 15 |
| | | | | | | | | | | |
| **Total Credits (Semester/Programme)** | | 20 | 20 | 27 | 28 | 23 | 26 | 20 | 15 | 179 |

| | |
|---|---|
| MAJOR PROGRAMME COURSES (BSC+ESC+PCC+PEC+V/SEC+Project/internship)-TOTAL CREDITS | 144 |
| MULTIDISCIPLINARY COURSES (OE/GE+MDM)-TOTAL CREDITS | 20 |
| HOLISTIC DEVELOPMENT COURSES INCL LL+HSSM-TOTAL CREDITS | 15 |

# DISTRIBUTION OF CATEGORY/ TYPE OF COURSES AND CREDITS FOR BTECH BIOENGINEERING



- Basic Sciences & Engineering Courses (30 C)
- Programme/ Specialization Elective Courses (9 C)
- Multidisciplinary Minors (MDM) (14 C)
- Experiential Learning (17 C)
- Programme Core Courses (78 C)
- Open/General Electives (6 C)
- Vocational and Skill Enhancement Courses (10 C)
- Holistic Course (15 C)

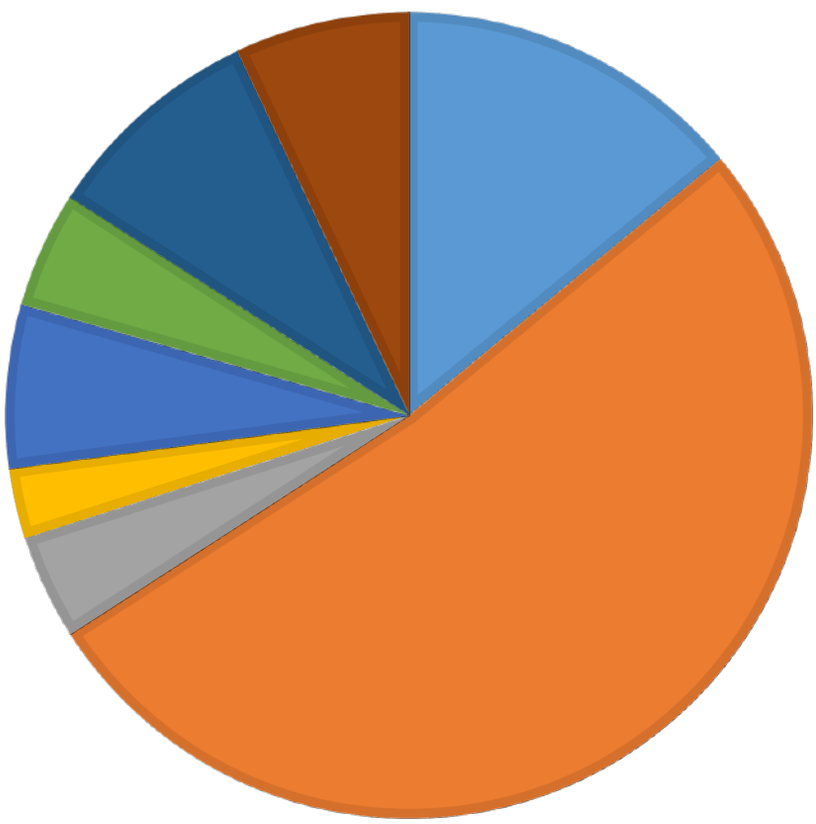
## Distribution of Category / Type of Courses and credits across Five-year Integrated M.Tech Programme in Bioengineering

| Category / Type of Courses | | Semester wise Credits | | | | | | | | | | Course wise Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI | VII | VIII | IX | X | |
| BSC/ESC | Basic Science Courses | 12 | 3 | | | | | | | | | 15 |
| | Engineering Science Courses | 6 | 3 | 6 | | | | | | | | 15 |
| Program Courses | Programme Core Course (PCC) | | 9 | 12 | 15 | 15 | 15 | 15 | 15 | 15 | | 111 |
| | Programme Elective Course (PEC) | | | | 3 | 3 | 3 | | | | | 9 |
| | | | | | | | | | | | | |
| Multidisciplinary Courses | Multidisciplinary Minor (MDM) | | | 3 | 3 | 3 | 3 | 2 | | | | 14 |
| | Open /Generic Electives (OE/GE) *(other than a particular program)* | | | | 3 | | 3 | | | | | 6 |
| | | | | | | | | | | | | |
| Skill Courses | Vocational and Skill Enhancement Courses | | | | | 2 | 2 | 2 | | | | 6 |
| | Skill Enhancement Courses (VSEC) | | | 2 | 2 | | | | | | | 4 |
| MD Holistic Development Courses-Humanities, Social Science and Management (HSSM)+Liberal Learning(LL) | Ability Enhancement courses (AEC) | 2 | 1 | 2 | 2 | | | | | | | 7 |
| | Indian Knowledge System (IKS) | | 2 | | | | | | | | | 2 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Value Education/Value Addition/Professional Ethics/Life skills Courses (VEC/VAC/EVLSC) | | 2 | | | | | | | | | 2 |
| | Co-curricular Courses (CC) | | | 2 | | | | | | | | 2 |
| | Entrepreneurship/Economics/Management Courses | | | | | | | 2 | | | | 2 |
| | | | | | | | | | | | | |
| Experiential Learning Courses | Research Methodology | | | | | | | | | | | |
| | Mini Projects/Field Project (MP/FP) | | | | | | | | | | | |
| | Project | | | | | | | | 2 | 2 | | 4 |
| | Internship | | | | | | | | | | 15 | 15 |
| | | | | | | | | | | | | |
| **Total Credits (Semester/Programme)** | | 20 | 20 | 27 | 28 | 23 | 26 | 21 | 17 | 17 | 15 | 214 |

| | |
|---|---|
| MAJOR PROGRAMME COURSES (BSC+ESC+PCC+PEC+V/SEC+Project/internship)-TOTAL CREDITS | 179 |
| MULTIDISCIPLINARY COURSES (OE/GE+MDM)-TOTAL CREDITS | 20 |
| HOLISTIC DEVELOPMENT COURSES INCL LL+HSSM-TOTAL CREDITS | 15 |

# DISTRIBUTION OF CATEGORY/TYPE OF COURSES AND CREDITS FOR INTEGRATED MTECH BIOENGINEERING



- Basic Sciences and Engineering Courses (30 C)
- Program/ Specialization Elective Courses (9 C)
- Multi Disciplinary Minors (14 C)
- Experiential Learning (19 C)
- Program Core Courses (111 C)
- Open Generic Electives (6 C)
- Vocational and Skill Enhancement Courses (10 C)
- Holistic Courses (15 C)

## Table 1
## Basic Sciences & Engineering Sciences Courses

| Sr. No. | Course Title | No. of Credits | Semester in which Course is offered | Remarks |
|---|---|---|---|---|
| 1 | Microbiology | 3 | I | BSC |
| 2 | Applied physics | 3 | I | BSC |
| 3 | Applied Chemistry | 3 | I | BSC |
| 4 | Biostatistics | 3 | I | BSC |
| 5 | Applied Mathematics | 3 | II | BSC |
| 6 | Basic mechanical Engineering | 3 | I | ESC |
| 7 | Basic electrical Engineering | 3 | I | ESC |
| 8 | Introduction to programming | 3 | II | ESC |
| 9 | Basic concepts in electronics | 3 | III | ESC |
| 10 | Core java and Python | 3 | III | ESC |

## Table 2
## Programme Core Courses

| Sr. No. | Course Title | No. of Credits | Semester in which Course is offered | Programme Detail |
|---|---|---|---|---|
| 1 | Genetics | 3 | II | BTech/Int. MTech |
| 2 | Cell Biology | 3 | II | BTech/Int. MTech |
| 3 | Biochemistry | 3 | II | BTech/Int. MTech |
| 4 | Human Anatomy & Physiology | 3 | III | BTech/Int. MTech |
| 5 | Basic concepts in Bioinformatics | 3 | III | BTech/Int. MTech |
| 6 | Molecular Biology | 3 | III | BTech/Int. MTech |
| 7 | Enzymology | 3 | III | BTech/Int. MTech |
| 8 | Genetic Engineering | 3 | IV | BTech/Int. MTech |
| 9 | Basic concepts in drug design | 3 | IV | BTech/Int. MTech |
| 10 | Immunology | 3 | IV | BTech/Int. MTech |
| 11 | Data Mining and Warehousing | 3 | IV | BTech/Int. MTech |
| 12 | Advanced Java | 3 | IV | BTech/Int. MTech |
| 13 | Genomics | 3 | V | BTech/Int. MTech |
| 14 | Essentials of Biophysics | 3 | V | BTech/Int. MTech |
| 15 | Microcontrollers and bioelectronics | 3 | V | BTech/Int. MTech |
| 16 | Machine Learning & Artificial Intelligence(AI) | 3 | V | BTech/Int. MTech |
| 17 | Fundamentals of Biochemical Engineering | 3 | V | BTech/Int. MTech |
| 18 | Metabolic engineering | 3 | VI | BTech/Int. MTech |
| 19 | Biosensors & IoT | 3 | VI | BTech/Int. MTech |
| 20 | Protein modeling | 3 | VI | BTech/Int. MTech |
| 21 | Biomedical instrumentation | 3 | VI | BTech/Int. MTech |
| 22 | Pharmacology | 3 | VI | BTech/Int. MTech |
| 23 | Robotics | 3 | VII | BTech/Int. MTech |
| 24 | Tissue Engineering | 3 | VII | BTech/Int. MTech |
| 25 | Pharmaceutical Engineering | 3 | VII | BTech/Int. MTech |
| 26 | Medical Imaging | 3 | VII | BTech/Int. MTech |
| 27 | Synthetic Biology | 3 | VII | Int. MTech |

## Table 2

| Sr. No. | Course Title | No. of Credits | Semester in which Course is offered | Programme Detail |
|---|---|---|---|---|
| 28 | Proteomics | 3 | VIII | Int. MTech |
| 29 | Digital signal processing | 3 | VIII | Int. MTech |
| 30 | Bioengineering systems control | 3 | VIII | Int. MTech |
| 31 | Biotransport | 3 | VIII | Int. MTech |
| 32 | Computational molecular and cell biology | 3 | VIII | Int. MTech |
| 34 | Agribiotechnology | 3 | IX | Int. MTech |
| 35 | Advanced Python | 3 | IX | Int. MTech |
| 36 | Next generation sequencing | 3 | IX | Int. MTech |
| 37 | Molecular Medicine | 3 | IX | Int. MTech |

## Table 3
## Programme/Specialization Elective Courses

| Sr. No. | Elective Basket No. | Course Title | No. of Credits | Programme/ Specilisation Title | Semester in which Course is offered |
|---|---|---|---|---|---|
| 1 | Elective -1 | Biomechanics | 3 | Biomedical | IV |
| | | Microbial engineering | 3 | Biotechnology | |
| | | Systems Biology | 3 | Bioinformatics | |
| 2 | Elective - 2 | Biomaterials and Artificial Organs I | 3 | Biomedical | V |
| | | Nanobiotechnology | 3 | Biotechnology | |
| | | Data Analytics | 3 | Bioinformatics | |
| 3 | Elective -3 | Biomaterials and Artificial Organs II | 3 | Biomedical | VI |
| | | Down Stream Processing | 3 | Biotechnology | |
| | | Health informatics | 3 | Bioinformatics | |

## Table 4

## Open/Generic Electives

| Sr. No. | Elective Basket No. | Course Title | No. of Credits | Name of the Department /Institute/School | Semester in which Course is offered |
|---|---|---|---|---|---|
| 1 | Elective course-1 | Food Laws and Regulations | 3 | Food technology | IV |
| | | Food Trade Management | 3 | Food technology | IV |
| | | Food Quality Assurance and Certification | 3 | Food technology | IV |
| 2 | Elective course-2 | By-product and Waste Utilization | 3 | Food technology | VI |
| | | Food Toxicants and Allergens | 3 | Food technology | VI |
| | | Speciality Food Processing Technology | 3 | Food technology | VI |

## Table 5 Multidisciplinary Minors (MDM)

| Sr. No. | Elective Basket No. | Course Title | No. of Credits | Name of the Department /Institute/School | Semester in which Course is offered |
|---|---|---|---|---|---|
| 1 | Web Application Development | Front-end Web Development | 3 | SOC | III |
| | | Server-side Programming | 3 | SOC | IV |
| | | Full Stack Development | 3 | SOC | V |
| | | SDLC | 3 | SOC | VI |
| | | Capstone Project | 2 | SOC | VII |
| 2 | Immersive Experience | Intelligent Game Design | 3 | SOC | III |
| | | Game Programming Language | 3 | SOC | IV |
| | | Augmented Reality | 3 | SOC | V |
| | | Virtual Reality | 3 | SOC | VI |
| | | Capstone Project | 2 | SOC | VII |
| 3 | Food Processing and Preservation | Basics of Food science | 3 | SFT | III |
| | | Principles of Food Processing | 3 | SFT | IV |
| | | Techniques of Food Preservation | 3 | SFT | V |
| | | Fermentation Technology | 3 | SFT | VI |
| | | Food Product development (project) | 2 | SFT | VII |
| 4 | Food safety and Quality | Basics of Food science | 3 | SFT | III |
| | | Human Nutrition | 3 | SFT | IV |
| | | Food safety and security | 3 | SFT | V |
| | | Food Regulations , Laws and Legislation | 3 | SFT | VI |
| | | Food Quality Assurance and Certification | 2 | SFT | VII |

## Table 6
## Vocational and Skill Enhancement Courses

| Sr. No. | Course Title | No. of Credits | Type of Courses | Semester in which Course is offered |
|---|---|---|---|---|
| 1 | Effective communication and human dynamics | 2 | SEC | III |
| 2 | Advanced Biostatistics | 2 | SEC | IV |
| 3 | Industrial safety and regulations | 2 | VSEC | V |
| 4 | Summer training | 2 | VSEC | VI |
| 5 | Intellectual property rights | 2 | VSEC | VII |

## Table 7

## Multidisciplinary Holistic Development Courses – Humanities, Social Sciences, Management + Liberal Learning

| Sr. No. | Course Title | No. of Credits | Type of Courses | Name of the Department /Institute/School | Semester in which Course is offered |
|---|---|---|---|---|---|
| 1 | Ability enhancement course-I | 2 | AEC | SHD | I |
| 2 | Ability enhancement course-II | 1 | AEC | SHD | II |
| 3 | Indian Knowledge System | 2 | IKS | SBSR | II |
| 4 | Introduction to environmental studies | 2 | VEC | SBSR | II |
| 5 | Ability enhancement course-III | 2 | AEC | SHD | III |
| 6 | Liberal Learning | 2 | CC-LL | SHD | III |
| 7 | Economics for engineers | 2 | AEC | SBSR | IV |
| 8 | Ethics/Entrepreneurship | 2 | MC | SBSR | VII |

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