



AMRITA
VISHWA VIDYAPEETHAM
DEEMED TO BE UNIVERSITY

School of
Engineering

(AMRITAPURI, BANGALORE, COIMBATORE, CHENNAI)

**B.Tech. in COMPUTER SCIENCE AND ENGINEERING
(ARTIFICIAL INTELLIGENCE)**

(BTC-AIE)

**CURRICULUM
2021**

GENERAL INFORMATION

ABBREVIATIONS USED IN THE CURRICULUM

Cat	-	Category
L	-	Lecture
T	-	Tutorial
P	-	Practical
Cr	-	Credits
ENGG	-	Engineering Sciences (including General, Core and Electives)
HUM	-	Humanities (including Languages and others)
SCI	-	Basic Sciences (including Mathematics)
PRJ	-	Project Work (including Seminars)
AES	-	Aerospace Engineering
AIE	-	Computer Science and Engineering - Artificial Intelligence
BIO	-	Biology
CCE	-	Computer and Communication Engineering
CHE	-	Chemical Engineering
CHY	-	Chemistry
CSE	-	Computer Science and Engineering
CVL	-	Civil Engineering
CUL	-	Cultural Education
EAC	-	Electronics and Computer Engineering
ECE	-	Electronics and Communication Engineering
EEE	-	Electrical and Electronics Engineering
ELC	-	Electrical and Computer Engineering
HUM	-	Humanities
MAT	-	Mathematics
MEE	-	Mechanical Engineering
PHY	-	Physics

Course Outcome (CO) – Statements that describe what students are expected to know, and are able to do at the end of each course. These relate to the skills, knowledge and behaviour that students acquire in their progress through the course.

Program Outcomes (POs) – Program Outcomes are statements that describe what students are expected to know and be able to do upon graduating from the Program. These relate to the skills, knowledge, attitude and behaviour that students acquire through the program. NBA has defined the Program Outcomes for each discipline.

PROGRAM OUTCOMES FOR ENGINEERING

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO's)

1. Integrate the foundations of mathematics, programming and domain knowledge to build AI enabled systems.
2. Acquire Skills in computational thinking required for the AI assisted engineering systems.
3. Acquire Skills to model the AI assisted decision making systems and to analyse the data from these systems to arrive at appropriate decisions.

SEMESTER I

Cat.	Course Code	Title	Credit
SCI	21MAT104	Mathematics for Intelligent System 1	3
SCI	21PHY104	Computational Engineering Mechanics 1	3
ENGG	21AIE105	Object Oriented Programming	4
ENGG	21AIE101	Elements of Computing Systems 1	3
ENGG	21AIE104	Introduction to Electrical Engineering	3
SCI	21BIO103	Intelligence of Biological Systems 1	2
ENGG	21AIE102	Introduction to Digital Manufacturing*	2
ENGG	21AIE103	Introduction to Drones*	2
HUM	19CUL101	Cultural Education I	2
HUM	19ENG111	Technical Communication	3
		TOTAL	27

SEMESTER II

Cat.	Course Code	Title	Credit
SCI	21MAT117	Mathematics for Intelligent Systems 2	3
SCI	21PHY113	Computational Engineering Mechanics 2	3
ENGG	21AIE114	Principles of Measurements & Sensors	3
ENGG	21AIE111	Data Structures & Algorithms 1	3
ENGG	21AIE112	Elements of Computing Systems - 2	3
ENGG	21AIE113	Introduction to Electronics	3
SCI	21BIO112	Intelligence of Biological Systems 2	2
HUM	19CUL111	Cultural Education II	2
		TOTAL	22

SEMESTER III

Cat	Course Code	Title	Cr
SCI	21MAT204	Mathematics for Intelligent Systems 3	3
ENGG	21AIE201	Introduction to Robotics	3
ENGG	21AIE202	Operating Systems	3
ENGG	21AIE203	Data Structures & Algorithms 2	3
ENGG	21AIE204	Introduction to Communication Systems	3
ENGG	21BIO201	Intelligence of Biological Systems 3	3
ENGG	21AIE205	Python for Machine Learning	1
HUM	19LAW300	Indian Constitution	P/F
HUM	19AVP201	Amrita Values Program-1	1
		Total	20

SEMESTER IV

Cat	Course Code	Title	Cr
SCI	21MAT212	Mathematics for Intelligent Systems 4	3
ENGG	21AIE211	Introduction to Computer Networks	3
ENGG	21AIE212	Design and Analysis of Algorithms	3
ENGG	21AIE213	Robotic Operating Systems & Robot Simulation	3
ENGG	21AIE214	Bigdata Analytics	3
ENGG	21BIO211	Intelligence of Biological Systems 4	3
HUM	19AVP211	Amrita Values Program-2	1
HUM	19ENV300	Environmental Science	P/F
HUM	19SSK211	Soft Skills I	2
		Total	21

SEMESTER V

Cat	Course Code	Title	Cr
SCI	21MAT301	Mathematics for Intelligent Systems 5	3
ENGG	21AIE301	Formal language and Automata	3
ENGG	21AIE302	Advanced Computer Networks	3
ENGG	21AIE303	Signal & Image Processing	3
ENGG	21AIE304	Big Data and Database Management	3
ENGG	19LIV390	Professional Elective 1*/Live-in Labs***	3
HUM	19SSK301	Soft. Skills II	2
HUM	19MNG300	Disaster Management	P/F
		Total	20

SEMESTER VI

Cat	Course Code	Title	Cr
SCI	21MAT311	Mathematics for Intelligent Systems 6	3
ENGG	21AIE311	Reinforcement Learning	3
ENGG	21AIE312	Deep Learning for Signal & Image Processing	3
ENGG	21AIE313	Introduction to Modern Compiler Design	3
ENGG	19LIV490	Professional Elective 2*/Live in labs ***	3
ENGG	21AIE314	AI in Natural Language Processing	3
ENGG	21AIE315	AI in Speech Processing	3
HUM	19SSK311	Soft Skills II	2
		Total	23

SEMESTER VII

Cat	Course Code	Title	Cr
ENGG	21AIE401	Deep Reinforcement Learning	3
ENGG		Professional Elective 3*	3
ENGG		Professional Elective 4*	3
ENGG		Free Elective 1**	2
ENGG		Free Elective 2**	2
PRJ	21AIE495	Project Phase - 1	4
		Total	17

SEMESTER VIII

Cat	Course Code	Title	Cr
PRJ	21AIE499	Project Phase - 2	10
		Total	10

		Total Credits		160
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@'Hands-on' Project-based Lab.

***Professional Elective** - Electives categorised under Engineering, Science, Mathematics, Live-in-Labs, and NPTEL Courses. Student can opt for such electives across departments/campuses. Students with CGPA of 7.0 and above can opt for a maximum of 2 NPTEL courses with the credits not exceeding 8.

**** Free Electives** - This will include courses offered by Faculty of Humanities and Social Sciences/ Faculty Arts, Commerce and Media / Faculty of Management/Amrita Darshanam -(International Centre for Spiritual Studies).

***** Live-in-Labs** - Students undertaking and registering for a Live-in-Labs project, can be exempted from registering for an Elective course in the higher semester.

PROFESSIONAL ELECTIVES			
POOL 1: AI IN CYBER SECURITY			
Cat	Course Code	Title	Cr
ENGG	21AIE431	Applied Cryptography	3
ENGG	21AIE432	Network and Wireless Security	3
ENGG	21AIE433	Intrusion Detection and Prevention Systems	3
ENGG	21AIE434	Software Vulnerability Analysis	3
ENGG	21AIE435	Cybercrime Forensics and Digital Forensics	3
ENGG	21AIE436	Distributed System Security	3
POOL 2: AI IN HEALTHCARE			
Cat	Course Code	Title	Cr
ENGG	21AIE451	Computational Healthcare	3
ENGG	21AIE452	Basics of Drug Design	3
ENGG	21AIE453	Deep learning in Genomics and Biomedicine	3
ENGG	21AIE454	Clinical Information Systems	3
ENGG	21AIE455	CRISPR Technology	3
ENGG	21AIE456	DNA Sequencing	3

POOL 3: AI IN ROBOTICS			
Cat	Course Code	Title	Cr
ENGG	21AIE441	Kinematics and Kinetics for Robotics	3
ENGG	21AIE442	Robotics Vision	3
ENGG	21AIE443	Dynamics and Control of Robotics	3
ENGG	21AIE444	Sensors for Robotics	3
ENGG	21AIE445	Application of Robotics	3

PROFESSIONAL ELECTIVES UNDER SCIENCE STREAM

CHEMISTRY			
Cat.	Code	Title	Credit
SCI	19CHY243	Computational Chemistry and Molecular Modelling	3
SCI	19CHY236	Electrochemical Energy Systems and Processes	3
SCI	19CHY240	Fuels and Combustion	3
SCI	19CHY232	Green Chemistry and Technology	3
SCI	19CHY239	Instrumental Methods of Analysis	3
SCI	19CHY241	Batteries and Fuel Cells	3
SCI	19CHY242	Corrosion Science	3
PHYSICS			
SCI	19PHY340	Advanced Classical Dynamics	3
SCI	19PHY342	Electrical Engineering Materials	3
SCI	19PHY331	Physics of Lasers and Applications	3
SCI	19PHY341	Concepts of Nanophysics and Nanotechnology	3
SCI	19PHY343	Physics of Semiconductor Devices	3
SCI	19PHY339	Astrophysics	3
Mathematics			
SCI	19MAT341	Statistical Inference	3
SCI	19MAT342	Introduction to Game Theory	3
SCI	19MAT343	Numerical Methods and Optimization	3

FREE ELECTIVES

FREE ELECTIVES OFFERED UNDER MANAGEMENT STREAM			
Cat.	Code	Title	Credit
HUM	19MNG331	Financial Management	3
HUM	19MNG332	Supply Chain Management	3
HUM	19MNG333	Marketing Management	3
HUM	19MNG334	Project Management	3
HUM	19MNG335	Enterprise Management	3
HUM	19MNG338	Operations Research	3
HUM	19MEE401	Industrial Engineering	3
HUM	19MEE346	Managerial Statistics	3
HUM	19MEE347	Total Quality Management	3
HUM	19MEE342	Lean Manufacturing	3
HUM	19CSE358	Software Project Management	3
HUM	19CSE359	Financial Engineering	3
HUM	19CSE360	Engineering Economic Analysis	3
HUM	19MNG331	Financial Management	3
HUM	19CSE362	Information Systems	3

FREE ELECTIVES OFFERED UNDER HUMANITIES / SOCIAL SCIENCE STREAMS

Cat.	Code	Title	Credit
HUM	19CUL230	Achieving Excellence in Life - An Indian Perspective	2
HUM	19CUL231	Excellence in Daily Life	2
HUM	19CUL232	Exploring Science and Technology in Ancient India	2
HUM	19CUL233	Yoga Psychology	2
HUM	19ENG230	Business Communication	2
HUM	19ENG231	Indian Thought through English	2
HUM	19ENG232	Insights into Life through English Literature	2
HUM	19ENG233	Technical Communication	2
HUM	19ENG234	Indian Short Stories in English	2
HUM	19FRE230	Proficiency in French Language (Lower)	2
HUM	19FRE231	Proficiency in French Language (Higher)	2
HUM	19GER230	German for Beginners I	2
HUM	19GER231	German for Beginners II	2
HUM	19GER232	Proficiency in German Language (Lower)	2
HUM	19GER233	Proficiency in German Language (Higher)	2
HUM	19HIN101	Hindi I	2
HUM	19HIN111	Hindi II	2
HUM	19HUM230	Emotional Intelligence	2
HUM	19HUM231	Glimpses into the Indian Mind - the Growth of Modern India	2
HUM	19HUM232	Glimpses of Eternal India	2
HUM	19HUM233	Glimpses of Indian Economy and Polity	2
HUM	19HUM234	Health and Lifestyle	2
HUM	19HUM235	Indian Classics for the Twenty-first Century	2
HUM	19HUM236	Introduction to India Studies	2
HUM	19HUM237	Introduction to Sanskrit Language and Literature	2
HUM	19HUM238	National Service Scheme	2
HUM	19HUM239	Psychology for Effective Living	2
HUM	19HUM240	Psychology for Engineers	2
HUM	19HUM241	Science and Society - An Indian Perspective	2
HUM	19HUM242	The Message of Bhagwad Gita	2

HUM	19HUM243	The Message of the Upanishads	2
HUM	19HUM244	Understanding Science of Food and Nutrition	2
HUM	19JAP230	Proficiency in Japanese Language (Lower)	2
HUM	19JAP2313	Proficiency in Japanese Language (Higher)	2
HUM	19KAN101	Kannada I	2
HUM	19KAN111	Kannada II	2
HUM	19MAL101	Malayalam I	2
HUM	19MAL111	Malayalam II	2
HUM	19SAN101	Sanskrit I	2
HUM	19SAN111	Sanskrit II	2
HUM	19SWK230	Corporate Social Responsibility	2
HUM	19SWK231	Workplace Mental Health	2
HUM	19TAM101	Tamil I	2
HUM	19TAM111	Tamil II	2