



AMRITA
VISHWA VIDYAPEETHAM
—DEEMED TO BE UNIVERSITY—

School of
Engineering

(AMRITAPURI, BANGALORE, COIMBATORE, CHENNAI)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.Tech. in COMPUTER SCIENCE AND ENGINEERING

(BTC-CSE)

**CURRICULUM
2019**

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 Educational Objectives (PEO):

- Graduate will strive on a global platform to pursue their professional career in Computer Science and Engineering.
- Graduate will contribute to product development as entrepreneurs in inter disciplinary fields of engineering and technology.
- Graduate will demonstrate high regard for professionalism, integrity and respect values in diverse culture, and have a concern for society and environment.

Program Specific Outcomes (PSO):

- Ability to design and engineer, innovative, optimal and elegant computing solutions to interdisciplinary problems using standard practices, tools and technologies.
- Ability to learn emerging computing paradigms for research and innovation

SEMESTER I

Cat.	Code	Title	Credit
HUM	19ENG111	Technical Communication	3
SCI	19MAT101	Single Variable Calculus	1
SCI	19MAT111	Multivariable Calculus	2
SCI	19MAT102	Matrix Algebra	2
ENGG	19CSE100	Problem Solving and Algorithmic Thinking	4
ENGG	19MEE100	Engineering Graphics - CAD	3
ENGG	19CSE101	Computer Systems Essentials	4
ENGG	19CSE180	Computer Hardware Essentials	1
HUM	19CUL101	Cultural Education - I	2
		TOTAL	22

SEMESTER II

Cat.	Code	Title	Credit
SCI	19MAT115	Discrete Mathematics	4
SCI	19MAT112	Linear Algebra	3
SCI	19PHY101	Engineering Physics - A	3
ENGG	19CSE102	Computer Programming	4
ENGG	19EEE111	Electrical and Electronics Engineering	3
ENGG	19EEE182	Electrical and Electronics Engineering Practice	1
ENGG	19CSE103	User Interface Design	2
ENGG	19CSE111	Fundamentals of Data Structures	2
ENGG	19MEE181	Manufacturing Practice	1
HUM	19CUL111	Cultural Education - II	2
		TOTAL	25

SEMESTER III

Cat.	Code	Title	Credit
SCI	19MAT201	Numerical Methods	1
SCI	19MAT202	Optimization Techniques	2
ENGG	19ECE204	Digital Electronics and Systems	4
ENGG	19CSE201	Advanced Programming	3
ENGG	19CSE205	Program Reasoning	3
ENGG	19CSE202	Database Management System	4
ENGG	19CSE204	Object Oriented Paradigm	3
ENGG	19ECE282	Digital Electronics and Systems Lab	1
HUM	19AVP201	Amrita Values Program I	1
		Total	22

SEMESTER IV

Cat.	Code	Title	Credit
SCI	19MAT205	Probability and Random Processes	4
ENGG	19CSE212	Data Structures and Algorithms	4
ENGG	19CSE214	Theory of Computation	3
ENGG	19CSE211	Computer Organization and Architecture	4
ENGG	19CSE213	Operating Systems	4
HUM	19AVP211	Amrita Values Program II	1
HUM		Free Elective I**	2
HUM	19SSK211	Soft Skills I	2
HUM	19MNG300	Disaster Management	P/F
		Total	24

SEMESTER V

Cat.	Code	Title	Credit
ENGG	19CSE305	Machine Learning	4
ENGG	19CSE302	Design and Analysis of Algorithms	4
ENGG	19CSE301	Computer Networks	4
ENGG	19CSE304	Foundations of Data Science	3
ENGG	19CSE303	Embedded Systems	4
ENGG		Professional Elective I*	3
HUM	19SSK301	Soft Skills II	2
ENGG	19LIV390	Live-in –Labs***	[3]
HUM	19ENV300	Environmental Science	P/F
		Total	24+[3]

SEMESTER VI

Cat.	Code	Title	Credit
ENGG	19CSE314	Software Engineering	3
ENGG	19CSE313	Principles of Programming Languages	3
ENGG	19CSE312	Distributed Systems	4
ENGG	19CSE311	Computer Security	3
ENGG		Professional Elective II*	3
ENGG		Professional Elective III*	3
HUM	19SSK311	Soft Skills III	2
ENGG	19LIV490	Live-in –Labs***	[3]
		Total	21+[3]

SEMESTER VII

Cat.	Code	Title	Credit
ENGG	19CSE401	Compiler Design	3
ENGG		Professional Elective IV*	3
ENGG		Professional Elective V*	3
ENGG		Professional Elective VI*	3
ENGG		Free Elective II**	2
PRJ	19CSE495/ 19CSE491	Project - Phase – 1 / Seminar	2
HUM	19LAW300	Indian Constitution	P/F
		Total	16

SEMESTER VIII

Cat.	Code	Title	Credit
PRJ	19CSE499	Project - Phase – 2	10
		Total	10
		Total Credit	164

***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

Electives in Cyber Security			
Cat.	Code	Title	Credit
ENGG	19CSE331	Cryptography	3
ENGG	19CSE332	Information Security	3
ENGG	19CSE333	Secure Coding	3
ENGG	19CSE334	Cyber Forensics and Malware	3
ENGG	19CSE335	Ethical Hacking	3
ENGG	19CSE336	Digital Currency Programming	3
ENGG	19CSE337	Social Networking and Security	3
ENGG	19CSE338	Mobile and Wireless Security	3

Electives in Computer Networks			
Cat.	Code	Title	Credit
ENGG	19CSE339	Wireless Sensor Networks	3
ENGG	19CSE340	Advanced Computer Networks	3
ENGG	19CSE341	Mobile Adhoc Networks	3
ENGG	19CSE342	Wireless and Mobile Communications	3

Electives in Data Science			
Cat.	Code	Title	Credit
ENGG	19CSE351	Computational statistics and Inference Theory	3
ENGG	19CSE352	Business Analytics	3
ENGG	19CSE353	Mining of Massive Datasets	3
ENGG	19CSE354	Web Mining	3
ENGG	19CSE355	Time Series Analysis and Forecasting	3
ENGG	19CSE356	Social Network Analytics	3
ENGG	19CSE357	Big Data Analytics	3

Electives in Computer Vision			
Cat.	Code	Title	Credit
ENGG	19CSE431	Digital Image Processing	3
ENGG	19CSE432	Pattern Recognition	3
ENGG	19CSE433	Computer Graphics and Visualization	3
ENGG	19CSE434	Image and Video Analysis	3
ENGG	19CSE435	Computer Vision	3
ENGG	19CSE436	Machine Vision	3
ENGG	19CSE437	Deep Learning for Computer Vision	3
ENGG	19CSE438	Medical Image Processing	3
ENGG	19CSE439	Augmented and Virtual Reality	3
ENGG	19CSE440	Biometrics	3

Electives in Cyber Physical Systems			
Cat.	Code	Title	Credit
ENGG	19CSE441	Introduction to Cyber-Physical Systems	3
ENGG	19CSE442	Pervasive and Ubiquitous Systems	3
ENGG	19CSE443	Spatiotemporal data management	3
ENGG	19CSE444	Real-Time Systems	3
ENGG	19CSE445	Cloud Computing	3
ENGG	19CSE446	Internet of Things	3

Electives in Artificial Intelligence			
Cat.	Code	Title	Credit
ENGG	19CSE451	Principles of Artificial Intelligence	3
ENGG	19CSE452	Semantic Web	3
ENGG	19CSE453	Natural Language Processing	3
ENGG	19CSE454	Information Retrieval	3
ENGG	19CSE455	Artificial Intelligence and Robotics	3
ENGG	19CSE456	Neural Networks and Deep Learning	3
ENGG	19CSE457	Bayesian Machine Learning	3
ENGG	19CSE458	Computational Intelligence	3

Electives General

Electives in Artificial Intelligence			
Cat.	Code	Title	Credit
ENGG	19CSE459	Advanced Algorithms and Analysis	3
ENGG	19CSE460	User Experience Design	3
ENGG	19CSE461	Net-Centric Programming	3
ENGG	19CSE462	Introduction to Game Theory	3

Professional Electives for Other Branches

Cat.	Code	Title	Credit
ENGG	19CSE471	Principles of Operating Systems	3
ENGG	19CSE463	Mobile Application Development	3
ENGG	19CSE464	Fundamentals of Software Engineering	3
ENGG	19CSE465	Introduction to Big Data Analytics	3
ENGG	19CSE466	Foundation of Information Technology	3

ENGG	19CSE467	Principles of Database Management Systems	3
ENGG	19CSE477	Principles of Computer Networks	3
ENGG	19CSE204	Object Oriented Paradigm	3
ENGG	19CSE201	Advanced Programming	3
ENGG	19CSE282	Python Programming	1

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
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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