REVA UNIVERSITY
Bengaluru, India

SCHOOL OF CIVIL ENGINEERING

HANDBOOK

M. Tech. in Transportation Engineering and Management

2020-22

Rukmini Knowledge Park,
Kattigenahalli, Yelahanka, Bangalore - 560 064
Phone No: +91-080-46966966

Rukmini Educational
Charitable Trust

www.reva.edu.in

Program Overview

Civil Engineering primarily deals with planning, design, construction, and operation of infrastructural facilities essential to modern life, ranging from transit systems to offshore structures to space satellites. Major disciplines within Civil Engineering that are closely interrelated are structural, environmental, geotechnical, water resources, transportation, construction and urban planning.

Transportation Engineering is one of the major branches of Civil Engineering and it involves planning, design, construction, operation and maintenance of transportation facilities. The facilities support air, highway, railroad, pipeline, water, and even space transportation. Transportation Engineering includes sizing of transportation facilities, selection of materials and design of pavement and geometry of roadway.

In Transportation Engineering, students acquire advanced know-how concerning the planning, design, operations, performance, evaluation, maintenance and rehabilitation of transportation systems including their economics and social aspects. This field imbibes in each student analytic, problem-solving and management skills suitable for public and private sector professional works. Students are trained on the application of various software and programming skills for simulation of traffic flow and Artificial Inteligence (AI), Internet of Things (IoT) and Intelligent Transportation System (ITS) applications to address urban transportation issues. The challenges faced in Transportation Engineering are developing network links and major terminals to satisfy transportation demands, with due regard for the resultant land-use, environmental and other impacts of these facilities.

The School of Civil Engineering at REVA UNIVERSITY offers M. Tech. in Transportation Engineering and Management –a postgraduate program to create motivated, innovative, creative and thinking graduates to fill the roles of Transportation Engineers and managers who can conceptualize, design, analyze, develop and manage transportation systems to meet the modern-day requirements.

Both public and private sectors across the globe are investing significantly in road development, airport construction, high-speed railways, metro rail, bridges, waterways and many such infrastructure projects necessitating the need for Transportation Engineers.In this context, the School of Civil Engineering at REVA UNIVERSITY would like to add to the growing human resources needs of the infrastructure sector as transportation designers and managers through its M. Tech. program in Transportation Engineering and Management.

M.Tech. programme in Transportation Engineering and Management has been structured to provide an in-depth knowledge to students of School of Civil Engineering in various subjects like Traffic Engineering, Urban Transport Plannin, Pavement Materials, Analysis and Design, Transportation Data Analysis, Railways, Airways and Harbour Engineering, Artificial Intelligence in Transportation Engineering, Applied Traffic Engineering,

Pavement Evaluation & Management System. The specialized soft core courses like IoT applications in Transportation, Intelligent Transportation Systems, Geometric Design of Highways, Road Safety and Management, GIS applications in Transportation Engineering, Land use and Transportation planning, Highway Economics and Finance and Environmental Impact of Transportation being offered will help students to specialize in different areas of their interest and industry needs.

Program Educational Objectives (PEO's)

After few years of post-graduation, the graduates of M.Tech CE (Transportation Engineering and Management) will be

PEO-1	Have successful professional careers in industry, government, academia and military as innovative engineers
PEO-2	Successfully solve engineering problems associated with the lifecycle of Civil Engineering system, in particular transportation engineering by communicating effectively either leading a team or as a team member with ethical practices.
PEO-3	Continue to learn and advance their careers through activities such as research and development, acquiring doctoral degree, participation in national level research programmes, teaching and research at university level etc.,
PEO-4	Active members ready to serve the society locally and internationally, may take up entrepreneurship for the growth of economy and to generate employment; and adopt the philosophy of lifelong learning to be aligned with economic and technological development.

Program Outcomes (POs)

On successful completion of the program, the graduates M.Tech CE (Transportation Engineering and Management) program will be able to:

PO1. **Demonstrate in-depth knowledge** of specific discipline or professional area, including wider and global perspective, with an ability to discriminate, evaluate, analyze and synthesize existing and new knowledge, and integration of the same for enhancement of knowledge.

PO2. **Analyze complex engineering problems critically**, apply independent judgment for synthesizing information to make intellectual and/or creative advances for conducting research in a wider theoretical, practical and policy context.

PO3. **Think laterally and originally, conceptualize and solve engineering problems, evaluate** a wide range of potential solutions for those problems and arrive at feasible, optimal solutions after considering public health and safety, cultural, societal and environmental factors in the core areas of expertise.

PO4. **Extract information pertinent to unfamiliar problems through literature survey and experiments**, apply appropriate research methodologies, techniques and tools, design, conduct experiments, analyze and interpret data, demonstrate higher order skill and view things in a broader perspective, contribute individually/in group(s) to the development of scientific/technological knowledge in one or more domains of engineering.

PO5. **Create, select, learn 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.

PO6. **Possess knowledge and understanding of group dynamics, recognize** opportunities and contribute positively to collaborative-multidisciplinary scientific research, demonstrate a capacity for self-management and teamwork, decision-making based on open-mindedness, objectivity and rational analysis in order to achieve common goals and further the learning of themselves as well as others.

PO7**. Demonstrate knowledge and understanding** of engineering and management principles and apply the same to one's own work, as a member and leader in a team, manage projects efficiently in respective disciplines and multidisciplinary environments after consideration of economical and financial factors.

PO8. **Communicate with the engineering community, and with society at large**, regarding **complex engineering activities** confidently and effectively, such as, being able to comprehend and write effective

reports and design documentation by adhering to appropriate standards, make effective presentations, and give and receive clear instructions.

PO9: **Recognize the need for**, and have the preparation and ability to engage in **life-long learning** independently, with a high level of enthusiasm and commitment to improve knowledge and competence continuously.

PO10. **Acquire professional and intellectual integrity,** professional code of conduct, ethics of research and scholarship, consideration of the impact of research outcomes on professional practices and an understanding of responsibility to contribute to the community for sustainable development of society.

PO11. **Observe and examine critically the outcomes** of one's actions and make corrective measures subsequently, and learn from mistakes without depending on external feedback (**SELF learning**)

Programme Specific Outcomes (PSO's)

On successful completion of the program, the graduates of M.Tech CE (Transportation Engineering and Management) program will be able to :

PSO-1: Apply knowledge of Transportation Engineering and management in real time.

PSO-2: Analyse a system, component or process in the knowledge areas of Transportation Engineering in real time problems.

PSO-3: Design a system, component, or process in more than one areas of Transportation Engineering.

PSO-4: Conduct investigations and address complex Transportation engineering problems; Utilize and develop innovative tools and techniques that are appropriate in Transportation Engineering discipline.

REVA UNIVERSITY
Bengaluru, India

M. Tech. (TRANSPORTATION ENGINEERING AND MANAGEMENT)

Programme Scheme of Instructions

(Effective from Academic Year 2020)

Scheme of Instructions 2020-22

I SEMESTER

Sl. No	Course Code	Title of the Course	HC/SC/OE	Pre requisite	Credit Pattern & Credit Value				Contact Hours
					L	T	P	Total	
1	M20TK0101	Artificial Intelligence in Transportation Engineering	HC	B.E/ B. Tech Civil Engineering	2	1	-	3	4
2	M20TK0102	Pavement Materials, Analysis and Design	HC		2	1	-	3	4
3	M20TK0103	Railways, Airways and Harbour Engineering	HC		2	1	-	3	4
4	M20TK0104	Traffic Engineering	HC		2	1	-	3	4
5	M20TK0105	Transportation Data Analysis	HC		2	1	-	3	4
6	M20TK0106	Urban Transport Planning	HC		2	1	-	3	4
7	M20TK0108	Mini Project-I	Practical		0	0	2	2	2
TOTAL								**20**	**26**
Practical									
8	M20TK0107	Traffic & Pavement Engineering laboratory	Practical/ HC		-	-	2	2	3
TOTAL								**02**	**03**
TOTAL SEMESTER CREDITS								**22**	
TOTAL CUMULATIVE CREDITS								**22**	
TOTAL CONTACT HOURS								**29**	

II SEMESTER

Sl. No	Course Code	Title of the Course	HC/SC/OE	Pre requisite	Credit Pattern & Credit Value				Contact Hours
					L	T	P	Total	
1	M20TK0201	Applied Traffic Engineering	HC	B.E/ B. Tech Civil Engineering	2	1	-	3	4
2	M20TK0202	Pavement Evaluation & Management System	HC		2	1	-	3	4
3	M20TKS211	Intelligent Transportation Systems	SC		2	1	-	3	4
	M20TKS212	IoT applications in Transportation			2	1	-	3	4
4	M20TKS221	Geometric Design of Highways	SC		2	1	-	3	4
	M20TKS222	Road Safety and Management			2	1	-	3	4
5	M20TKS231	GIS applications in Transportation Engineering	SC		2	1	-	3	4
	M20TKS232	Land use and Transportation planning.			2	1	-	3	4
6	M20TKS241	Environmental Impact of Transportation	SC		2	1	-	3	4
	M20TKS242	Highway Economics and Finance			2	1	-	3	4
7	M20TK0204	Mini Project-II	Practical		0	0	2	2	2
TOTAL								**20**	**26**
Practical									
8	M20TK0203	Transportation Software Laboratory	Practical/ HC		-	-	2	2	3
TOTAL								**02**	**03**
TOTAL SEMESTER CREDITS									**22**
TOTAL CUMULATIVE CREDITS									**44**
TOTAL CONTACT HOURS									**29**

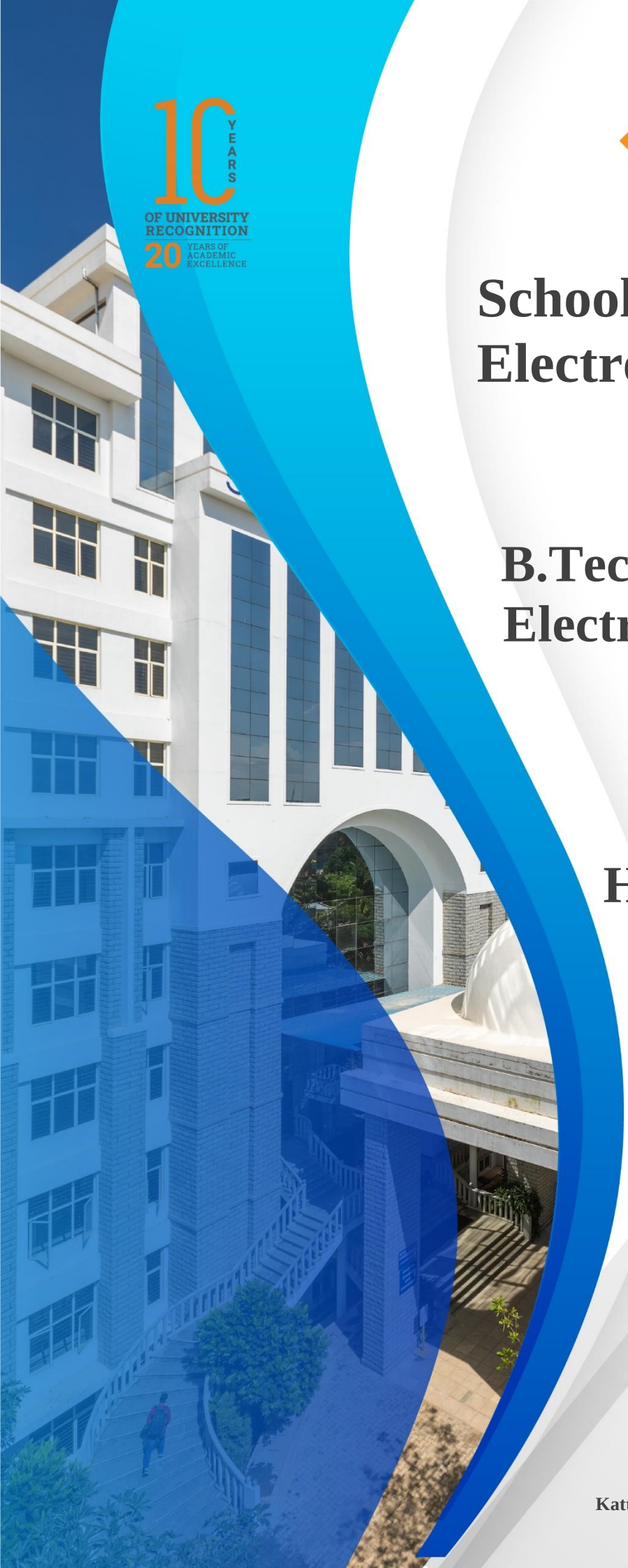
III SEMESTER

Sl. No	Course Code	Title of the Course	Practical /Term Work / Sessions	Pre requisite	Credit Pattern & Credit Value				Contact Hours
					L	T	P	Total	
1	M20TKON01	MOOC/SWAYAM Online course	ON	B.E/ B. Tech Civil Engineering	3	1	0	4	--
2	M20TK0301	Internship with Report	Practical/ Term Work and Viva - Voce		2	0	4	6	--
3	M20TK0302	Project Phase-I	Practical/ Report and Viva -Voce		2	0	4	6	--
TOTAL								**16**	
TOTAL SEMESTER CREDITS								**16**	
TOTAL CUMULATIVE CREDITS								**60**	
TOTAL CONTACT HOURS								**--**	

IV SEMESTER

Sl. No	Course Code	Title of the Course	Practical /Team Work / Sessions	Pre requisite	Credit Pattern & Credit Value				Contact Hours
					L	T	P	Total	
1	M20TK0401	Dissertation	Practical/ Thesis Submission and Viva-Voce		2	0	6	8	--
2	M20TK0402	Technical Seminar with Report	Practical/ Term Work		0	0	4	4	--
TOTAL								**12**	
TOTAL SEMESTER CREDITS								**12**	
TOTAL CUMULATIVE CREDITS								**72**	
TOTAL CONTACT HOURS								**-**	

HC = Hard Core: SC= Soft Core: OE = Open Elective



REVA UNIVERSITY
Bengaluru, India

School of Electrical and Electronics Engineering

B.Tech in Electrical and Electronics Engineering

Handbook – 2021-25

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SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING

HANDBOOK

B.Tech in Electrical and Electronics Engineering

2021-2025

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Phone No: +91-90211 90211/080-46966966

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Chancellor's Message

"Education is the most powerful weapon which you can use to change the world."

Nelson Mandela.

There was a time when survival depended on just the realization of physiological needs. We are indeed privileged to exist in a time when 'intellectual gratification' has become indispensable. Information is easily attainable for the soul that is curious enough to go look for it. Technological boons enable information availability anywhere anytime. The difference however, lies between those who look for information and those who look for knowledge.

It is deemed virtuous to serve seekers of knowledge and as educators it is in the ethos at REVA University to empower every learner who chooses to enter our portals. Driven by our founding philosophy of 'Knowledge is power', we believe in building a community of perpetual learners by enabling them to look beyond their abilities and achieve what they assumed impossible.

India has always been beheld as a brewing pot of unbelievable talent, acute intellect and immense potential. All it takes to turn those qualities into power is a spark of opportunity. Being at a University is an exciting and rewarding experience with opportunities to nurture abilities, challenge cognizance and gain competence.

For any University, the structure of excellence lies in the transitional abilities of its faculty and its facility. I'm always in awe of the efforts that our academic board puts in to develop the team of subject matter experts at REVA. My faculty colleagues understand our core vision of empowering our future generation to be ethically, morally and intellectually elite. They practice the art of teaching with a student centered and transformational approach. The excellent infrastructure at the University, both educational and extra-curricular, magnificently demonstrates the importance of ambience in facilitating focused learning for our students

A famous British politician and author from the 19th century - Benjamin Disraeli, once said 'A University should be a place of light, of liberty and of learning'. Centuries later this dictum still inspires me and I believe, it takes team-work to build successful institutions. I welcome you to REVA University to join hands in laying the foundation of your future with values, wisdom and knowledge.

Dr. P. Shyama Raju
The Founder and Hon'ble Chancellor, REVA University

Vice-Chancellor's Message

The last two decades have seen a remarkable growth in higher education in India and across the globe. The move towards inter-disciplinary studies and interactive learning have opened up several options as well as created multiple challenges. India is at a juncture where a huge population of young crowd is opting for higher education. With the tremendous growth of privatization of education in India, the major focus is on creating a platform for quality in knowledge enhancement and bridging the gap between academia and industry.

A strong believer and practitioner of the dictum "Knowledge is Power", REVA University has been on the path of delivering quality education by developing the young human resources on the foundation of ethical and moral values, while boosting their leadership qualities, research culture and innovative skills. Built on a sprawling 45 acres of green campus, this 'temple of learning' has excellent and state-of-the-art infrastructure facilities conducive to higher teaching-learning environment and research. The main objective of the University is to provide higher education of global standards and hence, all the programs are designed to meet international standards. Highly experienced and qualified faculty members, continuously engaged in the maintenance and enhancement of student-centric learning environment through innovative pedagogy, form the backbone of the University.

All the programs offered by REVA University follow the Choice Based Credit System (CBCS) with Outcome Based Approach. The flexibility in the curriculum has been designed with industry-specific goals in mind and the educator enjoys complete freedom to appropriate the syllabus by incorporating the latest knowledge and stimulating the creative minds of the students. Bench marked with the course of studies of various institutions of repute, our curriculum is extremely contemporary and is a culmination of efforts of great think-tanks - a large number of faculty members, experts from industries and research level organizations. The evaluation mechanism employs continuous assessment with grade point averages. We believe sincerely that it will meet the aspirations of all stakeholders – students, parents and the employers of the graduates and postgraduates of Reva University.

At REVA University, research, consultancy and innovation are regarded as our pillars of success. Most of the faculty members of the University are involved in research by attracting funded projects from various research level organizations like DST, VGST, DBT, DRDO, AICTE and industries. The outcome of the research is passed on to students through live projects from industries. The entrepreneurial zeal of the students is encouraged and nurtured through EDPs and EACs.

REVA University has entered into collaboration with many prominent industries to bridge the gap between industry and University. Regular visits to industries and mandatory internship with industries have helped our students become skilled with relevant to industry requirements. Structured training programs on soft-skills and preparatory training for competitive exams are offered here to make students more employable. 100% placement of eligible students speaks the effectiveness of these programs. The entrepreneurship development activities and establishment of “Technology Incubation Centers” in the University extend full support to the budding entrepreneurs to nurture their ideas and establish an enterprise.

With firm faith in the saying, “Intelligence plus character –that is the goal of education” (Martin Luther King, Jr.), I strongly believe REVA University is marching ahead in the right direction, providing a holistic education to the future generation and playing a positive role in nation building. We reiterate our endeavor to provide premium quality education accessible to all and an environment for the growth of over-all personality development leading to generating “GLOBAL PROFESSIONALS”.

Welcome to the portals of REVA University!

Dr. M Dhanamjaya

Vice-Chancelleor

Director's Message

The B.Tech in Electrical Engineering is designed keeping in view the current situation and possible future developments, both at national and global levels. This course is designed to give greater emphasis on core Electrical Engineering. There are ample number of courses providing knowledge in specialized areas of power system, electrical machines, control system, power electronics etc. facilitating students to choose specialized areas of their interest. Adequate attention is given to provide students the basic concepts.

Electrical engineering is one of the earliest to start among the core subjects. The structure of the course has undergone a face-lift with the introduction of subjects from computer science and electronics engineering streams. Thus students in Electrical engineering have the flexibility to broaden their horizons in electronics or software related industries apart from the core related fields. Thus the electrical engineering stream is designed to provide you with several options to choose from for your later years. Electrical Engineering use mathematics, electronics, computing techniques and physics to solve real world problems. The Indian government plans to add another 100 GW of generation capacity during 2012-2017 and to pump 1.4 trillion to build national power transmission grid which will enhance inter-regional transmission capacity to 32 GW by 2013. Hence power sector offers lots of job opportunities for well qualified graduates.

The program is thus designed to expose students to various subjects having applications in power sectors, and IT and electronics related industries through outcome based teaching and learning process which emphasizes practical exposure rather than memorization. The curriculum caters to and has relevance to local, regional, national, global developmental needs. Maximum number of courses are integrated with cross cutting issues with relevant to professional ethics, gender, human values, environment and sustainability. A variety of activities such as mini projects, seminars, interaction with industries, cultural activities and social activities are in place to shape the all-round development of students.

The curriculum caters to and has relevance to local, regional, national, global developmental needs.

Maximum number of courses are integrated with cross-cutting issues with relevant to professional ethics, gender, human values, environment and sustainability.

If you are interested in any one of the following, then EEE is the option you should consider.

- Power sector- to design robust power system, to implement measures to keep the system secure, to maintain quality of power, to mitigate harmonics, to damp oscillations, to design protective measures using relays and circuit breaker etc
- Renewable energy sources- to harness power from renewable sources using power electronics devices, to study integration of these sources with the grid.
- Transport- electric vehicles, vehicle to grid power transactions
- High –Voltage engineering – study of breakdown mechanisms of insulators, search for new types of insulators, development of high voltage testing equipment.
- Power Electronics- design of compact and highly efficient power supplies, battery energy storage system, ultra-capacitor applications, aerospace power requirements, UPS, applications in power system using FACTS devices, interconnection of two regions via HVDC link
- Computer – Developing algorithms to solve complex functions, developing simulation tools to simulate the entire system, applications to SMART grid.

The benefits of choosing Electrical and Electronics Engineering are:

- Flexibility to choose various fields upon graduation.
- Opportunity to work on live problems.
- Opportunity to work on environmental related technologies.
- Opportunity for programmers to develop software for electrical related projects.

I am sure the students choosing B Tech in Electrical and Electronics Engineering in REVA University will enjoy the curriculum, teaching and learning environment, the vast infrastructure and the experienced teachers involvement and guidance. We will strive to provide all needed comfort and congenial environment for their studies. I wish all students pleasant stay in REVA and grand success in their career.

Dr. Rajashekar P Mandi

School of Electrical and Electronics Engineering

Program Overview

Electrical Engineering is a discipline of engineering that utilizes natural resources for generation, transmission and utilization of electric power. In addition, electrical engineering deals with design, analysis, prototyping, manufacturing, and maintenance of electrical generators, electric motors, transformers, transmission and distribution equipment, wiring and lighting and electrical appliances. In the recent past, the use of electronics for control of electrical systems is gaining importance and the discipline is known as Electrical and Electronic Engineering instead of pure Electrical Engineering. It is one of the oldest and broadest engineering disciplines. The present day electrical engineers focus on use of renewable sources like solar photovoltaic, wind and other non-renewable energy sources for power generation.

Electricity became a subject of scientific interest in the late 17th century. Probably the greatest discovery with respect to power engineering came from Michael Faraday who in 1831 discovered that a change in magnetic flux induces an electromotive force in a loop of wire—a principle known as electromagnetic induction that helps explain how generators and transformers work. In 1881, using two waterwheels electricity was produced in the world's first power station at Godalming in England. Thomas Edison produced continuous power using steam power in 1882. At present, electric power is being produced using Thermal, Hydro, Solar, Wind and many other non-renewable and renewable energy sources and at present world's installed capacity of electric power is 16000 GW.

India has one National Grid with an installed capacity of 344.00 GW as on 31 May 2018 out of which 69.02 GW is from renewable energy sources. India's being very active in renewable energy sector would like to achieve an installed total capacity of 175 GW by 31 March 2022, and the central Govt. has set up US$350 million fund to finance the solar projects.

Overall employment of electrical and electronics engineers is projected to grow 7 percent over the next ten years, about as fast as the average for all occupations. At present, the world power sector is facing global warming crisis due to large scale emission of carbon dioxide from thermal power plants. The future is about production of electrical power that is free from production of carbon dioxide, a greenhouse gas responsible for global warming. Thus there is a demand for electrical and electronic engineers who could play key roles in new developments with solar arrays, semiconductors, and wind power technologies. The need to upgrade the nation's power grids will also create demand for electrical engineering services.

The School of Electrical and Electronics Engineering at REVA UNIVERSITY offers B. Tech., Electrical and Electronics –an undergraduate programme to create motivated, innovative, creative and thinking graduates

to fill the roles of Electrical Engineers who can conceptualize, design, analyze, develop and produce Electrical Power Systems to meet the modern-day requirements.

The B. Tech., in Electrical and Electronics Engineering curriculum developed by the faculty at the School of Electrical and Electronics Engineering, is outcome based and it comprises required theoretical concepts and practical skills in the domain. By undergoing this programme, students develop critical, innovative, creative thinking and problem-solving abilities for a smooth transition from academic to real-life work environment. In addition, students are trained in interdisciplinary topics and attitudinal skills to enhance their scope. The above-mentioned features of the programme, advanced teaching and learning resources, and experience of the faculty members with their strong connections with power and energy sector makes this programme unique.

ACADEMIC OBJECTIVES

- To encourage faculty to acquire skills to implement novel teaching methods that emphasize critical thinking, self-learning, group discussions and self-appraisal
- To encourage students to take part in paper presentation contests and other co-curricular activities to enhance their skills.
- To provide opportunities for students to carry out mini projects to strengthen their fundamentals.
- To setup high quality research lab in the School.
- To establish industry-university alliance to set up research lab.
- To carry out applied research work and to attract consultancy works.
- To initiate students exchange program with overseas universities.
- To initiate summer industrial training program for students.

Program Educational Objectives (PEO's)

After few years of graduation, the graduates of B. Tech in Electrical & Electronics Engineering will:

- PEO 1: Work as a member or lead a team for successful career and communicate effectively in multidisciplinary environment with highest ethics
- PEO 2: Continue to learn in the areas of Electrical & Electronics Engineering and allied areas and implement effective strategies with the advancement of technologies in Electrical & Electronics Engineering
- PEO 3: Become an entrepreneur in the domain of Electrical & Electronics Engineering and other allied areas

Program Outcomes (POs)

On successful completion of the Program, the graduates of B. Tech in Electrical & Electronics Engineering will:

- PO 1: Understand the concept, identify, formulate, and solve complex electrical engineering problems by applying knowledge & principles of engineering, science, and mathematics
- PO 2: Identify, formulate, review research literature, analyze, interpret and draw conclusions from quantitative & qualitative data of an electrical and electronics system, component, or process to meet desired needs.
- PO 3: Design solutions for engineering problems and system components related to electrical & electronic systems that meet economic, environmental, social, political, health, safety and sustainability requirements.
- PO 4: 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 in the field of electrical & electronics engineering.
- PO 5: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling of complex electrical and electronics circuits with an understanding of the limitations.
- PO 6: Apply contextual knowledge to assess social, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO 7: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO 8: Apply ethical principles and solve professional, legal and ethical issues pertaining to electrical & electronics engineering and its related fields
- PO 9: Function effectively as a team member or leader in diverse teams to accomplish a common goal in a multi-disciplinary team.
- PO 10: Communicate effectively on complex engineering activities with the engineering community and with society at large in both verbal and written forms.

- PO 11: Demonstrate knowledge and understanding of the engineering and management principles to manage projects effectively in diverse environments as a member or leader of a team.
- PO 12: Engage in independent and life-long learning in the broader context of technological change for continued professional development

Program Specific Outcomes (PSO)

On successful completion of the program, the graduates of B. Tech in Electrical & Electronics Engineering will:

- PSO 1: Apply the fundamentals of mathematics, science and engineering knowledge to identify, formulate, design and investigate complex engineering problems of electric circuits, analog and digital electronic circuits, control systems, electrical machines, power system, renewable energy system and electric vehicle
- PSO 2: Apply the appropriate, state of the art techniques and modern engineering hardware and software tools in electrical and electronics engineering to engage in life-long learning and to successfully adapt in multi-disciplinary environments
- PSO 3: Aware of the impact of professional engineering solutions in societal, environmental context, professional ethics and be able to communicate effectively

SCHEME OF INSTRUCTION

I SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/SC/OE	Credit Pattern & Credit Value				Contact Hours/ Week
				L	T	P	Total	
1	B20AS0102	Calculus and Differential Equations	FC	3	0	0	3	3
2	B20AS0104	Engineering Chemistry	FC	2	1	0	3	3
3	B20CI0101	Introduction to Python Programming	HC	2	0	1	3	4
4	B20EE0101	Basic Electrical and Electronics Engineering	HC	3	0	1	4	5
5	B20ME0103	Elements of Mechanical and Civil Engineering	HC	3	0	0	3	3
TOTAL				**13**	**1**	**2**	**16**	**18**
Practical /Term Work / Sessions								
6	B20AS0109	Biology for Engineers	FC	1	0	0	1	1
7	B20ME0102	Design Thinking	FC	1	0	1	2	3
TOTAL				**2**	**0**	**1**	**3**	**4**
TOTAL SEMESTER CREDITS								**19**
TOTAL CUMULATIVE CREDITS								**19**
TOTAL CONTACT HOURS								**22**

II SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/SC/OE	Credit Pattern & Credit Value				Contact Hours/ Week
				L	T	P	Total	
1	B20AS0203	Integral Transforms	FC	4	0	0	4	4
2	B20AS0202	Engineering Physics	FC	3	0	1	4	5
3	B20CS0101	Introduction to Data Science	HC	2	0	1	3	4

4	B20EE0202	Electrical Power Generation and Transmission	HC	3	0	0	3	3
5	B20EE0201	Electrical and Electronic Measurements	HC	2	0	1	3	4
TOTAL				**14**	**0**	**3**	**17**	**20**
Practical /Term Work / Sessions								
6	B20EC0101	IoT and Applications	HC	1	0	1	2	3
7	B20ME0104	Entrepreneurship	HC	1	0	0	1	1
8	B20EE0203	Electrical Safety, Earthing & Solar PV System	HC	0	0	1	1	2
TOTAL				**2**	**0**	**2**	**4**	**6**
TOTAL SEMESTER CREDITS								**21**
TOTAL CUMULATIVE CREDITS								**40**
TOTAL CONTACT HOURS								**26**

III SEMESTER

III SEMESTER

Sl. No	**Course Code**	**Title of the Course**	**HC/FC/SC/ OE**	**Credit Pattern & Credit Value**				**Contact Hours / Week**
				L	**T**	**P**	**Total**	
1	B20AS0305	Linear algebra and Partial Differential Equations	FC	3	0	0	3	3
2	B20EE0301	Electrical Circuit Theory	FC	3	0	0	3	3
3	B20EM0302	Electrical Machines-I	HC	3	0	0	3	3
4	B20EE0302	Problem Solving Using C Programming	HC	2	0	0	2	2
5	B20EM0301	Analog Electronic & Linear Integrated Circuits	HC	3	0	0	3	3
TOTAL				**14**	**0**	**0**	**14**	**14**
Practical /Term Work / Sessions								
6	B20EE0303	Problem Solving Using C Programming Lab	HC	0	0	1	1	2

7	B20EM0303	Analog Electronic & Linear Integrated Circuits	HC	0	0	1	1	2
8	B20EM0304	Electrical Machines-I Lab	HC	0	0	1	1	2
9	B20AS0301	Environmental Science	FC	2	0	0	2	2
10	B20MGM301	Management Science	FC	2	0	0	2	2
11	B20AHM302 /301	Basics of Kannada/Advanced Kannada	MC	0	0	0	0	1
TOTAL				**4**	**0**	**3**	**7**	**11**
TOTAL SEMESTER CREDITS								**21**
TOTAL CUMULATIVE CREDITS								**61**
TOTAL CONTACT HOURS								**25**

IV SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/SC/OE	Credit Pattern & Credit Value				Contact Hours/ Week
				L	T	P	Total	
1	B20AS0402	Probability and Random Process	FC	3	0	0	3	3
2	B20EM0401	Electrical Machines-II	HC	3	0	0	3	3
3	B20EM0403	Physics – Electromagnetism	FC	3	0	0	3	3
4	B20EM0402	Electrical Power Utilization	HC	3	0	0	3	3
5	B20EE0401	Microcontrollers and Applications	HC	3	0	0	3	3
6	B20XXS4XX	Professional Elective-1	SC	3	0	0	3	3
TOTAL				**18**	**0**	**0**	**18**	**18**
Practical /Term Work / Sessions								
7	B20EE0402	Microcontrollers and Applications Lab	HC	0	0	1	1	2
8	B20EM0404	Electrical Machines-II Lab	HC	0	0	1	1	2
9	B20AH0301	Communication Skills	FC	2	0	0	2	2
10	B20LS0301	Indian Constitution & Professional Ethics	FC	2	0	0	2	2

11	B20AHM401	Universal Human Values	HC	0	0	0	0	1
TOTAL				**4**	**0**	**2**	**6**	**9**
TOTAL SEMESTER CREDITS								**24**
TOTAL CUMULATIVE CREDITS								**85**
TOTAL CONTACT HOURS								**27**

V SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/SC/OE	Credit Pattern & Credit Value				Contact Hours/ Week
				L	T	P	Total	
1	B20EE0501	Control System Engineering	HC	3	0	0	3	3
2	B20EE0502	Power Electronics	HC	3	0	0	4	5
3	B20EM0501	Object Oriented Programming using C++	HC	3	0	0	4	5
4	B20XXS5XX	Professional Elective-2	SC	3	0	0	3	3
5	B20XXO5XX	Open Elective 1	OE	3	0	0	3	3
TOTAL				**15**	**0**	**0**	**17**	**19**
Practical /Term Work / Sessions								
6	B20EE0505	Control System Lab	HC	0	0	1	1	2
7	B20EE0506	Power Electronics Lab	HC	0	0	1	1	2
8	B20EM0502	C++ Lab	HC	0	0	1	1	2
9	B20EE0503	Technical Documentation	FC	1	0	0	1	1
10	B20EE0504	Mini project/Internship	HC	0	0	2	2	4
TOTAL				**1**	**0**	**5**	**6**	**11**
TOTAL SEMESTER CREDITS								**23**
TOTAL CUMULATIVE CREDITS								**108**
TOTAL CONTACT HOURS								**30**

VI SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/SC/OE	Credit Pattern & Credit Value				Contact Hours/ Week
				L	T	P	Total	
1	B20EE0601	Computer Aided Electrical Drawing	HC	3	0	1	4	5
2	B20EM0601	High Voltage Engineering	HC	3	0	0	3	3
3	B20EM0602	Digital System Design	HC	3	0	0	3	3

4	B20XXS6XX	Professional Elective-3	SC	3	0	0	3	3
5	B20XXO6XX	Open Elective 2	OE	3	0	0	3	3
TOTAL				**15**	**0**	**1**	**16**	**17**
Practical /Term Work / Sessions								
6	B20EM0603	High Voltage Engineering Lab	HC	0	0	1	1	2
7	B20EM0604	Digital System Design Lab	HC	0	0	1	1	2
8	B20PA0501	Indian Tradition and Culture	FC	1	0	0	1	1
9	B20EE0602	Embedded System Design	FC	1	0	1	2	3
10	B20EE0603	Research Based Project	HC	0	0	1	1	2
TOTAL				**2**	**0**	**4**	**6**	**10**
TOTAL SEMESTER CREDITS								**22**
TOTAL CUMULATIVE CREDITS								**130**
TOTAL CONTACT HOURS								**27**

VII SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/SC/OE	Credit Pattern & Credit Value				Contact Hours/ Week
				L	T	P	Total	
1	B20EE0701	Computer Aided Power System Analysis	HC	3	0	0	3	3
2	B20EM0701	Signal Processing	HC	3	0	0	3	3
3	B20EM0702	Renewable Energy System	HC	3	0	0	3	3
4	B20XXS7XX	Professional Elective-4	SC	3	0	0	3	3
5	B20XXS7XX	Professional Elective-5	SC	3	0	0	3	3
6	B20XXO7XX	Open Elective 3	OE	3	0	0	3	3
TOTAL				**18**	**0**	**0**	**18**	**18**
Practical /Term Work / Sessions								
7	B20EM0703	Power System Analysis Lab	HC	0	0	1	1	**2**
8	B20EM0704	Signal Processing Lab	HC	0	0	1	1	**2**
9	B20EE0702	Major Project Phase-1	HC	0	0	2	2	**4**

TOTAL	0	0	2	2	**4**
TOTAL SEMESTER CREDITS					**20**
TOTAL CUMULATIVE CREDITS					**150**
TOTAL CONTACT HOURS					**25**

VIII SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/SC/OE	Credit Pattern & Credit Value				Contact Hours/ Week
				L	T	P	Total	
1	B20XXO8XX	Open Elective 4	OE	3	0	0	3	3
TOTAL				**3**	**0**	**0**	**3**	**3**
Practical /Term Work / Sessions								
2	B20EE0801	Major Project Phase-2	HC	1	1	5	7	13
TOTAL				1	1	5	7	**14**
TOTAL SEMESTER CREDITS								**10**
TOTAL CUMULATIVE CREDITS								**160**
TOTAL CONTACT HOURS								**17**

Professional Elective-1

Sl No	Course Code	Title of the Course
1.	B20EES401	Data Structures using Python
2.	B20EES402	Electrical Engineering Materials
3.	B20EES403	Energy Storage Systems
4.	B20EES404	Programmable Logic Circuits
5.	B20EES405	Switch Gear and Protection

Professional Elective-2

Sl No	Course Code	Title of the Course
1.	B20EES501	Design of Electrical Machines
2.	B20EES502	Electric Drives
3.	B20EES503	Embedded Systems & IOT
4.	B20EES504	Operation Research
5.	B20EES505	Smart Grid
6.	B20EES506	Relational Data Base Management System

Professional Elective-3

Sl No	Course Code	Title of the Course
1.	B20EES601	Advance Power Electronics
2.	B20EES602	Electric & Hybrid Vehicles
3.	B20EES603	Electrical Power Quality
4.	B20EES604	Modeling and Simulation of Electrical Machines
5.	B20EES605	Reactive Power Management
6.	B20EES606	VLSI Circuits and Design
7.	B20EES607	Big Data Analytics and Cloud Computing
8.	B20EES608	JAVA Programming

Professional Elective-4

Sl No	Course Code	Title of the Course
1.	B20EES701	Advance Control Engineering
2.	B20EES702	Fundamentals of Robotics
3.	B20EES703	HVDC
4.	B20EES704	Industrial Instrumentation and Automation
5.	B20EES705	Power System Planning and Reliability
6.	B20EES706	Computer Networks

Professional Elective-5

Sl No	Course Code	Title of the Course
1.	B20EES707	Advanced Electrical Machines
2.	B20EES708	Advanced Microcontrollers
3.	B20EES709	Electrical Standard & Electricity regulations
4.	B20EES710	Operation and Control of Power Systems
5.	B20EES711	Testing and Commissioning of Electrical Equipment
6.	B20EES712	Artificial Intelligence & Machine Learning Techniques

OPEN ELECTIVES OFFERED TO OTHER SCHOOLS

Sl No	Course Code	Title of the Course	Semester offered
1	B20EEO501	Energy Conservation	5
2	B20EEO601	Electrical Power Utlization and Safety ~~(Electrical Safety and Regulations)~~	6
3	B20EEO701	Renewable Energy System	7
4	B20EEO801	Trouble Shooting of Common Electrical Appliances	8

REVA UNIVERSITY
Bengaluru, India

School of Computer Science & Engineering

B. Tech. in Computer Science and Engineering

Handbook 2021-25

Rukmini Knowledge Park
Kattigenahalli, Yelahanka, Bengaluru – 560064
www.reva.edu.in

REVA UNIVERSITY
Bengaluru, India

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

Handbook

B. Tech. in Computer Science and Engineering

2021-2025

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Phone No: +91-080-66226622, Fax: 080-28478539

Rukmini Educational
Charitable Trust

www.reva.edu.in

Chancellor's Message

"Education is the most powerful weapon which you can use to change the world."
- Nelson Mandela.

There was a time when survival depended on just the realization of physiological needs. We are indeed privileged to exist in a time when 'intellectual gratification' has become indispensable. Information is easily attainable for the soul that is curious enough to go look for it. Technological boons enable information availability anywhere anytime. The difference, however, lies between those who look for information and those who look for knowledge.

It is deemed virtuous to serve seekers of knowledge. As educators, it is in the ethos at REVA University to empower every learner who chooses to enter our portals. Driven by our founding philosophy of 'Knowledge is Power', we believe in building a community of perpetual learners by enabling them to look beyond their abilities and achieve what they assumed impossible.

India has always been beheld as a brewing pot of unbelievable talent, acute intellect and immense potential. All it takes to turn those qualities into power is a spark of opportunity. Being at a University is an exciting and rewarding experience with opportunities to nurture abilities, challenge cognizance and gain competence.

For any University, the structure of excellence lies in the transitional abilities of its faculty and its facility. I'm always in awe of the efforts that our academic board puts in to develop the team of subject matter experts at REVA. My faculty colleagues understand our core vision of empowering our future generation to be ethically, morally and intellectually elite. They practice the art of teaching with a student-centered and transformational approach. The excellent infrastructure at the University, both educational and extra-curricular, magnificently demonstrates the importance of ambience in facilitating focused learning for our students.

A famous British politician and author from the 19th century - Benjamin Disraeli, once said 'A University should be a place of light, of liberty and of learning'. Centuries later this dictum still inspires me and I believe, it takes team-work to build successful institutions. I welcome you to REVA University to join hands in laying the foundation of your future with values, wisdom and knowledge.

Dr. P. Shyama Raju
The Founder and Hon'ble Chancellor, REVA University

Vice-Chancellor's Message

The last two decades have seen a remarkable growth in higher education in India and across the globe. The move towards inter-disciplinary studies and interactive learning have opened up several options as well as created multiple challenges. India is at a juncture where a huge population of young crowd is opting for higher education. With the tremendous growth of privatization of education in India, the major focus is on creating a platform for quality in knowledge enhancement and bridging the gap between academia and industry.

A strong believer and practitioner of the dictum "Knowledge is Power", REVA University has been on the path of delivering quality education by developing the young human resources on the foundation of ethical and moral values, while boosting their leadership qualities, research culture and innovative skills. Built on a sprawling 45 acres of green campus, this 'temple of learning' has excellent and state-of-the-art infrastructure facilities conducive to higher teaching-learning environment and research. The main objective of the University is to provide higher education of global standards and hence, all the programs are designed to meet international standards. Highly experienced and qualified faculty members, continuously engaged in the maintenance and enhancement of student-centric learning environment through innovative pedagogy, form the backbone of the University.

All the programs offered by REVA University follow the Choice Based Credit System (CBCS) with Outcome Based Approach. The flexibility in the curriculum has been designed with industry-specific goals in mind and the educator enjoys complete freedom to appropriate the syllabus by incorporating the latest knowledge and stimulating the creative minds of the students. Bench marked with the course of studies of various institutions of repute, our curriculum is extremely contemporary and is a culmination of efforts of great think-tanks - a large number of faculty members, experts fromindustries and research level organizations. The evaluation mechanism employs continuous assessment with grade point averages. We believe sincerely that it will meet the aspirations of all stakeholders – students, parents and the employers of the graduates and postgraduates of REVA University.

At REVA University, research, consultancy and innovation are regarded as our pillars of success. Most of the faculty members of the University are involved in research by attracting funded projects

from various research level organizations like DST, VGST, DBT, DRDO, AICTE and industries. The outcome of the research is passed on to students through live projects from industries. The entrepreneurial zeal of the students is encouraged and nurtured through EDPs and EACs.

REVA University has entered into collaboration with many prominent industries to bridge the gap between industry and University. Regular visits to industries and mandatory internship with industries have helped our students. REVA University has entered into collaboration with many prominent industries to bridge the gap between industry and University. Regular visits to industries and mandatory internship with industries have helped our students become skilled with relevant to industry requirements. Structured training programs on soft-skills and preparatory training for competitive exams are offered here to make students more employable. 100% placement of eligible students speaks the effectiveness of these programs. The entrepreneurship development activities and establishment of "Technology Incubation Centers" in the University extend full support to the budding entrepreneurs to nurture their ideas and establish an enterprise.

With firm faith in the saying, "Intelligence plus character –that is the goal of education" (Martin Luther King, Jr.), I strongly believe REVA University is marching ahead in the right direction, providing a holistic education to the future generation and playing a positive role in nation building. We reiterate our endeavor to provide premium quality education accessible to all and an environment for the growth of over-all personality development leading to generating "GLOBAL PROFESSIONALS".

Welcome to the portals of REVA University!

Dr. M Dhanamjaya

Vice-Chancellor, REVA University

Director's – Message

I congratulate and welcome all the students to the esteemed school of Computing and Information technology (C & IT)). You are in the right campus to become a computer technocrat. The rising needs of automation in Industry 4.0 and improvising living standards have enabled rapid development of computer software and hardware technologies. Thus, providing scope and opportunity to generate more human resources in the areas of computers and IT. The B.Tech, M.Tech and Ph.D. programs offered in the school are designed to cater the requirements of industry and society. The curriculum is designed meticulously in association with persons from industries (TCS, CISCO, AMD, MPHASIS, etc.), academia and research organizations (IISc, IIIT, Florida University, Missouri S & T University, etc).This handbook presents the B. Tech in Computer Science and Engineering program curriculum. The program is of 4 years duration and split into 8 semesters. The courses are classified into foundation core, hard core, and soft-core courses. Hard core courses represent fundamentals study requirements of CSE. Soft courses provide flexibility to students to choose the options among several courses as per the specialization, such as, AI, Data Science, and Systems. Theoretical foundations of engineering, science, and computer science are taught in first two and half years. Later, advanced courses and recent technologies are introduced in subsequent semesters for pursuing specialization.

The important features of the BTech CSE are as follows: 1) Choice based course selection and teacher selection, 2) Studies in emerging areas like Machine Learning, Artificial Intelligence, Data Analytics, Cloud Computing, Python/R Programming, NLP, IoT and Cloud security, 3) Short and long duration Internships 4) Opportunity to pursue MOOC course as per the interest in foundation and soft core courses, 5) Attain global and skill certification as per the area of specialization, 6) Self-learning components, 7) Experiential, practice, practical, hackathons, and project based learning, 8) Mini projects and major projects with research orientation and publication, 9) Soft skills training and 10) Platform for exhibiting skills in cultural, sports and technical activities through clubs and societies.

The school has well qualified faculty members in the various areas of computing and IT including cloud computing, security, IOT, AI, ML and DL, software engineering, computer networks, cognitive computing, etc. State of art laboratories are available for the purpose of academics and research. The curriculum caters to and has relevance to local, regional, national, global developmental needs. Maximum number of courses are integrated with cross cutting issues relevant to professional ethics, gender, human values, environment and sustainability.

Dr. Sunilkumar S. Manvi,

Director,
School of Computing and IT

CONTENTS

RUKMINI EDUCATIONAL CHARITABLE TRUST

It was the dream of late Smt. Rukmini Shyama Raju to impart education to millions of underprivileged children as she knew the importance of education in the contemporary society. The dream of Smt. Rukmini Shyama Raju came true with the establishment of **Rukmini Educational Charitable Trust (RECT),** in the year 2002. Rukmini Educational Charitable Trust (RECT) is a Public Charitable Trust, set up in 2002 with the objective of promoting, establishing and conducting academic activities in the fields of Arts, Architecture, Commerce, Education, Engineering, Environmental Science, Legal Studies, Management and Science & Technology, among others. In furtherance of these objectives, the Trust has set up the REVA Group of Educational Institutions comprising of REVA Institute of Technology & Management (RITM), REVA Institute of Science and Management (RISM), REVA Institute of Management Studies (RIMS), REVA Institute of Education (RIE), REVA First Grade College (RFGC), REVA Independent PU College at Kattigenahalli, Ganganagar and Sanjaynagar and now REVA University. Through these institutions, the Trust seeks to fulfill its vision of providing world class education and create abundant opportunities for the youth of this nation to excel in the areas of Arts, Architecture, Commerce, Education, Engineering, Environmental Science, Legal Studies, Management and Science & Technology.

Every great human enterprise is powered by the vision of one or more extraordinary individuals and is sustained by the people who derive their motivation from the founders. The Chairman of the Trust is Dr. P. Shyama Raju, a developer and builder of repute, a captain of the industry in his own right and the Chairman and Managing Director of the DivyaSree Group of companies. The idea of creating these top notched educational institutions was born of the philanthropic instincts of Dr. P. Shyama Raju to do public good, quite in keeping with his support to other socially relevant charities such as maintaining the Richmond road park, building and donating a police station, gifting assets to organizations providing accident and trauma care, to name a few.

The Rukmini Educational Charitable Trust drives with the main aim to help students who are in pursuit of quality education for life. REVA is today a family of ten institutions providing education from PU to Post Graduation and Research leading to PhD degrees. REVA has well qualified experienced teaching faculty of whom majority are doctorates. The faculty is supported by committed administrative and technical staff. Over 15,000+ students study various courses across REVA's three campuses equipped with exemplary state-of-the-art infrastructure and conducive environment for the knowledge driven community.

ABOUT REVA UNIVERSITY

REVA University has been established under the REVA University Act, 2012 of Government of Karnataka and notified in Karnataka State Gazette dated 7thFebruary, 2013. The University is recognized by UGC under Sec 2 (f) and empowered under Sec.22 of the UGC Act, 1956 to award degrees in any branch of knowledge. The Programs of the University are approved by All India Council for Technical Education (AICTE), University Grants Commission (UGC), Bar Council of India (BCI), and Council of Architecture (COA). The University is a Member of Association of Indian Universities, New Delhi. The main objective of the University is to prepare students with knowledge, wisdom and patriotism to face the global challenges and become the top leaders of the country and the globe in different fields.

REVA University located in between Kempegowda International Airport and Bangalore city, has a sprawling green campus spread over 45 acres of land and equipped with state-of-the-art infrastructure that provide conducive environment for higher learning and research. The REVA campus has well equipped laboratories, auditoriums, seminar halls, custom-built teaching facilities, fully air-conditioned library and central computer center, well-planned sports facility with cricket ground, running track & variety of indoor and outdoor sports activities, facilities for cultural programs. The unique feature of REVA campus is the largest residential facility for students, faculty members and supportive staff.

The University is presently offering 26 Post Graduate Degree programs, 35 Undergraduate programs in various branches of studies and has 15000+ students studying in various branches of knowledge at graduate and post graduate level and 494 Scholars pursuing research leading to PhD in 19 disciplines. It has 900+ well qualified, experienced and committed faculty members of whom majority are doctorates in their respective areas and most of them are guiding students pursuing research leading to PhD.

The programs being offered by the REVA University are well planned and designed after detailed study with emphasis on knowledge assimilation, applications, global job market and their social relevance. Highly qualified, experienced faculty and scholars from reputed universities / institutions, experts from industries and business sectors have contributed in preparing the scheme of instruction and detailed curricula for this program. Greater emphasis on practice in respective areas and skill development to suit to respective job environment has been given importance while designing the curricula. The Choice Based Credit System and Continuous Assessment Graded Pattern (CBCS – CAGP) of education has been introduced in all programs to facilitate students to opt for subjects of their

choice in addition to the core subjects of the study and prepare them with needed skills. The system also allows students to move forward under the fast track for those who have the capabilities to surpass others. These programs are taught by well experienced qualified faculty supported by the experts from industries, business sectors and such other organizations. REVA University has also initiated many supportive measures such as bridge courses, special coaching, remedial classes, etc., for slow learners so as to give them the needed input and build in them confidence and courage to move forward and accomplish success in their career. The University has also entered into MOUs with many industries, business firms and other institutions seeking their help in imparting quality education through practice, internship and also assisting students' placements.

REVA University recognizing the fact that research, development and innovation are the important functions of any university has established an independent Research and Innovation division headed by a senior professor as Dean of Research and Innovation. This division facilitates all faculty members and research scholars to undertake innovative research projects in engineering, science &technology and other areas of study.

The interdisciplinary-multidisciplinary research is given the top most priority. The division continuously liaisons between various funding agencies, R&D Institutions, Industries and faculty members of REVA University to facilitate undertaking innovative projects. It encourages student research projects by forming different research groups under the guidance of senior faculty members. Some of the core areas of research wherein our young faculty members are working include Data Mining, Cloud Computing, Image Processing, Network Security, Big data analytics, Information Retrival, VLSIand Embedded Systems, Wireless Sensor Networks, Artificial Intelligence, Computer Networks, IOT, MEMS, Nano- Electronics, Wireless Communications, Bio-fuels, Nano-technology for coatings, Composites, Vibration Energies, Electric Vehicles, Multilevel Inverter Application, Battery Management System, , LED Lighting, Renewable Energy Sources and Active Filter, Innovative Concrete Reinforcement, Electro Chemical Synthesis, Energy Conversion Devices, Nano-structural Materials, Photo-electrochemical Hydrogen generation, Pesticide Residue Analysis, Nano materials, Photonics, Nano Tribology, Fuel Mechanics, Operation Research, Graph theory, Strategic Leadership and Innovative Entrepreneurship, Functional Development Management, Resource Management and Sustainable Development, Cyber Security, General Studies, Feminism, Computer Assisted Language Teaching, Culture Studies etc.

The REVA University has also given utmost importance to develop much required skills through variety of training programs, industrial practice, case studies and such other activities that induce the said

skills among all students. A full-fledged Career Development and Placement (CDC) School with world class infrastructure, headed by a dynamic experienced Professor and Dean, and supported by well experienced Trainers, Counselors and Placement Officers. The University also has University-Industry Interaction (UIIC) and Skill Development Centre headed by a Senior Professor and Director facilitating skill related training to REVA students and other unemployed students. The University has been recognized as a Centre of Skill Development and Training by NSDC (National Skill Development Corporation) under Pradhan Mantri Kaushal Vikas Yojana. The Centre conducts several add-on courses in challenging areas of development. It is always active in facilitating student's variety of Skill Development Training programs, Entrepreneurship activities, and IPR workshops. UIIC has established REVA NEST, an incubation center for promoting start up industries.

The University has collaborations with Industries, universities abroad, research institutions, corporate training organizations, and Government agencies such as Florida International University, Okalahoma State University, Western Connecticut University, University of Alabama, University of California Berkeley, Arkansas State University, Columbia University, Huntsville, Oracle India Ltd, Texas Instruments, Nokia University Relations, EMC^2, VMware, SAP, Apollo etc, to facilitate student exchange and teacher–scholar exchange programs and conduct training programs. These collaborations with foreign universities also facilitate students to study some of the programs partlyin REVA University and partly in foreign university, viz, M.S in Computer Science one year in REVA University and the next year in the University of Alabama, Huntsville, USA.

The University has also given greater importance to quality in education, research, administration and all activities of the university. Therefore, it has established an independent Internal Quality division headed by a senior professor as Dean of Internal Quality. The division works on planning, designing and developing different quality tools, implementing them and monitoring the implementation of these quality tools. It concentrates on training entire faculty to adopt the new tools and implement their use. The division further works on introducing various examination and administrative reforms.

To motivate the youth and transform them to become innovative entrepreneurs, successful leaders of tomorrow and committed citizens of the country, REVA organizes interaction between students and successful industrialists, entrepreneurs, scientists and such others from time to time. As a part ofthis exercise great personalities such as Bharat Ratna Prof. C. N. R. Rao, a renowned Scientist, Dr. N R Narayana Murthy, Founder and Chairman and Mentor of Infosys, Dr. K Kasturirangan, Former Chairman ISRO, Member of Planning Commission, Government of India, Dr. Balaram, Former Director I.I.Sc., and noted Scientist, Dr. V S Ramamurthy, Former Secretary, DST, Government of India, Dr. V K

Aatre, noted Scientist and former head of the DRDO and Scientific Advisor to the Ministry of Defense Dr. Sathish Reddy, Scientific Advisor, Ministry of Defense, New Delhi and many others have accepted our invitation and blessed our students and faculty members by their inspiring addresses and interaction.

As a part of our effort in motivating and inspiring youth of today, REVA University also has instituted awards and prizes to recognize the services of teachers, researchers, scientists, entrepreneurs, social workers and such others who have contributed richly for the development of the society and progress of the country. One of such award instituted by REVA University is **'Life Time Achievement Award'** to be awarded to successful personalities who have made mark in their field of work. This award is presented on occasion of the **"Founders' Day Celebration"** of REVA University on 6th January of every year in presence of dignitaries, faculty members and students gathering. The first "**REVA Life Time Achievement Award**" for the year 2015 has been awarded to Shri. Kiran Kumar, Chairman ISRO, followed by Shri. Shekhar Gupta, renowned Journalist for the year 2016, Dr K J Yesudas, renowned play back singer for the year 2017. REVA also introduced "**REVA Award of Excellence"** in the year 2017 and the first Awardee of this prestigious award is Shri Ramesh Aravind, Actor, Producer, Director, Screen Writer and Speaker.

REVA organizes various cultural programs to promote culture, tradition, ethical and moral values to our students. During such cultural events the students are given opportunities to unfold their hidden talents and motivate them to contribute innovative ideas for the progress of the society. One of such cultural events is REVOTHASAVA conducted every year.

The event not only gives opportunities to students of REVA but also students of other Universities and Colleges. During three days of this mega event students participate in debates, Quizzes, Group discussion, Seminars, exhibitions and variety of cultural events. Another important event is ShubhaVidaaya, - Graduation Day for the final year students of all the programs, wherein, the outgoing students are felicitated and are addressed by eminent personalities to take their future career in a right spirit, to be the good citizens and dedicate themselves to serve the society and make a mark in their respective spheres of activities. During this occasion, the students who have achieved top ranks and won medals and prizes in academic, cultural and sports activities are also recognized by distributing awards and prizes. The founders have also instituted medals and prizes for sports achievers every year. The physical education School conducts regular yoga classes every day to students, faculty members, administrative staff and their family members and organizes yoga camps for villagers around.

Within short span of time, REVA University has been recognized as a fast growing university imparting quality higher education to the youth of the country and received many awards, ranks, and accolades from various agencies, institutions at national and international level. These include: Asia's Greatest Brand and Leaders, by Asia One, National Award of Leadership Excellence, by ASSOCHAM India, Most promising University, by EPSI, Promising Upcoming Private University in the Country, by The Economic Times, Best University of India (South), by Dialogue India, Gold Brand by QS University Ranking, placed under 151-200 band by NIRF, 6TH Rank in the Super Excellence category by GHRDC, 6TH Rank in All India Law School Survey, ranked among Top 30 Best B Schools by Business World, India's Best Law Institution by Careers 360, to mention a few.

REVA University

Vision

''REVA University aspires to become an innovative university by developing excellent human resources with leadership qualities, ethical and moral values, research culture and innovative skills through higher education of global standards".

Mission

- To create excellent infrastructure facilities and state-of-the-art laboratories and incubation centers
- To provide student-centric learning environment through innovative pedagogy and education reforms
- To encourage research and entrepreneurship through collaborations and extension activities
- To promote industry-institute partnerships and share knowledge for innovation and development
- To organize society development programs for knowledge enhancement in thrust areas
- To enhance leadership qualities among the youth and enrich personality traits, promote patriotism and moral values.

Objectives

- Creation, preservation and dissemination of knowledge and attainment of excellence in different disciplines
- Smooth transition from teacher - centric focus to learner - centric processes and activities
- Performing all the functions of interest to its major constituents like faculty, staff, students and the society to reach leadership position
- Developing a sense of ethics in the University and Community, making it conscious of its obligations to the society and the nation
- Accepting the challenges of globalization to offer high quality education and other services in a competitive manner.

Quality Policy

- Check the quality and standards of education provided at undergraduate, postgraduate and Ph.D. levels to enhance the academic experience of the students.

- Take appropriate action to meet the quality standards at each level.
- Scrutinize the proposals for improving existing programms and conduct industry research to check whether the suggestions can be implemented.
- Maintain policies, regulations, and best practices of the University.
- Give proper support to faculties throughout the process of periodic review, programme evaluation, and program modifications.
- Ensure that admissions are taking place based on merit and aptitude.
- Provide faculty orientation to qualified teachers to train them with up-to-date knowledge of teaching methods and industry skills.
- Ensure that the latest instructional and laboratory facilities are provided.
- Ensure the compliance of regulations with governing and regulatory bodies.

ABOUT THE SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

The School has a rich blend of experienced and committed faculty who are well qualified in various aspects of Computer Science and Engineering apart from the numerous state-of-the-art digital classrooms and laboratories having modern computing equipment. The School offers B Tech in Computer Science and Engineering and postgraduate programs offered in the Schoolare: M Tech in Computer Science and Engineering (Both Full time and Part time).

In addition, the School has a unique academic collaboration with the University of Alabama in Huntsville to jointly offer an MS program in Computer Science. In addition, the School has a research center in which students can conduct cutting edge research leading to a PhD degree.

Curricula of both undergraduate and postgraduate programs have been designed through a collaboration of academic and industry experts in order to bridge the growing gap between industry and academia. This makes the program highly practical-oriented, and thus industry-resilient. The B Tech program aims to create quality human resources to play leading roles in the contemporary, competitive industrial and corporate world.

The masters' degrees focus on quality research and design in the core and application areas of computing to foster a sustainable world and to enhance the global quality of life by adopting enhanced design techniques and applications. This thought is reflected in the various courses offered in the masters' programs.

Vision

School of Computer Science and Engineering aspires to create a pool of high-calibre technologists and researchers in the field of computer science and engineering who have potential to contribute for development of the nation and society with their expertise, skills, innovative problem-solving abilities and strong ethical values.

Mission

MD1: To create center of excellence where new ideas flourish and from which emerge tomorrow'sresearchers, scholars, leaders, and innovators.

MD2: Provide quality education in both theoretical and applied foundations of computer science andengineering, related inter-disciplinary areas and train students to effectively apply the knowledge to solve real-world problems.

MD3: Amplify student's potential for life-long high-quality careers and make them competitive inever-changing and challenging global work environment.

MD4: Forge research and academic collaboration with industries and top global universities in orderto provide students with greater opportunities.

MD5: Support the society by encouraging and participating in technology transfer.

Quality Policy

The School of Computer Science and Engineering is committed to excellence through following policies.

1. Impart quality education by providing state of art curriculum, experimental learning, and state of the art labs.
2. Enhance skill set of faculty members through faculty development programmes and interaction with academia and industries.
3. Inculcate the competency in software/hardware design and programming through co-curricular activities like Hackathon, Project exihibition, Internship and Enterpreneuship Programme.
4. Provide soft skill and skill development training for personality development and better placement.
5. Promote innovation and research culture among students and support faculty members for better research and development activity.

ADVISORY BOARD

S. No.	Name	Designation
1	Dr. Bhanu Prasad	Professor, School of Computer and Information Sciences, Florida A & M University (FAMU) , USA
2	Dr. Rajkumar Buyya	Director, Cloud Computing and Distributed Systems Laboratory, School of Computing and Information Systems, University of Melbourne, Australia
3	Dr. Heggere S. Ranganathi	Professor and Chair, Computer Science School, University of Alabama in Huntsville, Huntsville, AL 35899, USA.
4	Dr. S. S. Iyengar	Professor, Louisiana State University (LSU), USA.
5	Dr. Manjunath Joshi	Professor, Dhirubhai Ambani Institute of Information and Communication Technology, Gandhinagar
6	Dr. L. M. Patnaik	Adjunct Professor and INSA Senior ScientistConsciousness Studies Program, National Institute of Advanced Studies, IISc Campus. Bengaluru.
7	Mr. P. B. Kotur	Head - Global Freshers Engagement Program, Wipro Limited, Bengaluru.
8	Dr. Vivek Venkobarao	Continental Corporation Limited, Bengaluru.

CORPORATE ADVISORY BOARD

S. No.	Name	Designation
1	Mr. Suresh Kumar R	CTO CCS India & Digital Incubators at GE-Healthcare Bengaluru, Karnataka, India.
2	Mr. Abhas Abhinav	Entrepreneur specializing in Free Software and Liberated Hardware, Bengaluru, Karnataka, India.
3	Mr. Manjunath D S	Senior Micro Architect, Intel Technologies India Pvt. Ltd.,Bengaluru, Karnataka, India.
4	Mr. T Sabapathy	Nominations Committee Member, CSI, Bengaluru, Karnataka, India.
5	Mr. PrabhugoudaBiradar	VP-Engineering, Huawei Technologies India Pvt. Ltd., Bengaluru, Karnataka, India.
6	Mr. Kiran N	Leader Strategic Enterprise Architecture, Boeing, Bangalore Urban, Karnataka, India.

MEMBERS OF BOARD OF STUDIES

Sl.No	Name, Designation and Affiliation	Status	Correspondence Address
1.	**Dr Sunil Kumar S Manvi** Professor and Director School of CSE and CIT, REVA University	Chair Person	Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru, Karnataka 560064
2.	**Dr MallikarjunaShastry P** Professor, School of CSE, REVA University	Member (Internal)	Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru, Karnataka 560064
3.	**Dr Kiran Kumari Patil**, Professor, School of CSE, Director UIIC, REVA University	Member (Internal)	Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru, Karnataka 560064
4.	**Dr Mallikarjuna M Kodabagi**, Professor and Deputy Director IQAC, REVA University	, Member (Internal)	Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru, Karnataka 560064
5.	**Dr Ashwin Kumar U M** Professor and Deputy Director, School of CSE, REVA University	Member (Internal)	Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru, Karnataka 560064
6.	**Dr. Meenakshi Sundaram** Associate Professor, School of CSE, REVA University	Member (Internal)	Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru, Karnataka 560064
7.	**Dr. Amuthabala** Associate Professor, School of CSE, REVA University	Member (Internal)	Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru, Karnataka 560064
8.	**Dr. Shantala Devi Patil** Associate Professor, School of CSE, REVA University	Member (Internal)	Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru, Karnataka 560064
9.	**Dr. Vishwanath Y**, Associate Professor School of CSE, REVA University	Member (Internal)	Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru, Karnataka 560064
10.	**Mr. Chetan Shivakumar,** CEO & Cofounder, Aikaan Labs Pvt Ltd, Bengaluru	Member	CEO & Cofounder, Aikaan Labs Pvt Ltd, Bengaluru
11.	**Mr. Muralidhar Jahagirdhar**, Practice Head Engineering, ATMECS Technology Pvt Ltd, Hyderabad	Member	Practice Head Engineering, ATMECS Technology Pvt Ltd, Hyderabad
12.	**Mr. RavikantSoni**, Technical Manager, Solution Architect, Standard Chartered bank, Bengaluru.	Member	Technical Manager, Solution Architect, Standard Chartered bank, Bengaluru.
13.	**Dr Sanjay**, HoD Dept. of ISE, NITTE Meenakshi Institute of Technology, Bengaluru	Member	HoD Dept. of ISE, NITTE Meenakshi Institute of Technology, Bengaluru

14.	**Dr Raghavendra Kulkarni**, Director of Academics, M. S. Ramaiah University of Applied Sciences, Bengaluru	Member	Director of Academics, M. S. Ramaiah University of Applied Sciences, Bengaluru

B.TECH in COMPUTER SCIENCE AND ENGINEERING

Program Overview

The School of Computer Science andEngineering (CSE) encompasses a variety of topics that relates to computation, like development of algorithms, analysis of algorithms, programming languages, and software design and computer hardware. Computer Science and Engineering has roots in electrical engineering, mathematics, and linguistics. In the past computer science was taught as part of mathematics or engineering Schools and in the last 3 decades it has emerged as a separate engineering field. In the present information era (Knowledge era) computer science and engineering will see an exponential growth as the future machines work on artificial intelligence.

The oldest known complex computing device, called the Antikythera mechanism, dates back to 87 B.C., to calculate astronomical positions and help Greeks navigate through the seas.
Computing took another leap in 1843, when English mathematician Ada Lovelace wrote the first computer algorithm, in collaboration with Charles Babbage, who devised a theory of the first programmable computer. But the modern computing- machine era began with Alan Turing's conception of the Turing Machine, and three Bell Labs scientist's invention of the transistor, which made modern-style computing possible, and landed them the 1956 Nobel PrizeinPhysics.Fordecades,computingtechnologywasexclusivetothegovernmentandthemilitary;later, academic institutions came online, and Steve Wozniak built the circuit board for Apple-1, making home computing practicable. On the connectivity side, Tim Berners-Lee created the World Wide Web, and Marc Andreessen built a browser, and that's how we came to live in a world where our glasses can tell us what we're looking at. With wearable computers, embeddable chips, smart appliances, and other advances in progress and on the horizon, the journey towards building smarter, faster and more capable computers is clearly justbeginning.

Computers have become ubiquitous part of modern life, and new applications are introduced everyday. The use of computer technologies is also commonplace in all types of organizations, in academia, research, industry, government, private and business organizations. As computers become even more pervasive, the potential for computer-related careers will continue to grow and the career paths in computer-related fields will become more diverse. Since 2001, global information and communication technologies (ICTs) have become more powerful, more accessible, and more widespread. They are now pivotal in enhancing competitiveness, enabling development, and bringing progress to all levels of society.

The career opportunities for computer science and engineering graduates are plenty and growing. Programming and software development, information systems operation and management, telecommunications and networking, computer science research, web and Internet, graphics and multimedia, training and support, and computer industry specialists are some of the opportunities the graduates find.

The School of Computer Science and Engineering at REVA UNIVERSITY offers B. Tech in Computer Science and Engineering programme to create motivated, innovative, creative thinking graduates to fill ICT positions across sectors who can conceptualize, design, analyse, and develop ICT applications to meet the modern-day requirements.

The B. Tech., in Computer Science and Engineering curriculum developed by the faculty at the School of Computer Science and Engineering, is outcome based and it comprises required theoretical concepts and practical skills in the domain. By undergoing this programme, students develop critical, innovative, creative thinking and problem-solving abilities for a smooth transition from academic to real-life work environment. In addition, students are trained in interdisciplinary topics and attitudinal skills to enhance their scope. The abovementioned features of the programme, advanced teaching and learning resources, and experience of the faculty members with their strong connections with ICT sector makes this programme unique.

The curriculum caters to and has relevance to local, regional, national and global developmental needs. Maximum number of courses are integrated with cross cutting issues with relavant to professional ethics Gender human values environment and sustainability.

Program Educational Objectives (PEOs)

The program helps to develop critical, analytical, innovative, creative and problem solving abilities amongst its graduates. The programme makes the graduates employable as Software Engineers across sectors. With further education and earning of higherlevel degrees help the graduates to pursue a career in academics or scientific organisations as researchers.

After few years of graduation, the graduates of B. Tech. (Computer Science and Engineering) will:

- **PEO-1**: Have a successful professional career in industry, government, academia and defence as an innovative engineer in a team.
- **PEO-2**: Develop a code and solutions to industry and societal needs in a rapid changing technological environment and communicate with clients as an entrepreneur.
- **PEO-3:** Pursue higher studies and continue to learn by participating in conferences, seminars, etc.

Program Outcomes (POs)

On successful completion of the program, the graduates of B. Tech. (Computer Science and Engineering) program will be able to:

- **PO-1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals for the solution of complex problems in Computer Science and Engineering.
- **PO-2: Problem analysis:** Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions using first principles of mathematics, natural, and engineering sciences.
- **PO-3: Design/development of solutions:** Design solutions for complex engineering problems and design system components, processes to meet the specifications with consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **PO-4**: **Conduct investigations of complex problems**: Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO-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.
- **PO-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.
- **PO-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.
- **PO-8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **PO-9: Individual and team work**: Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

- **PO-10: Communication**: Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations and give and receive clear instructions.
- **PO-11: Project management and finance**: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.
- **PO-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.

Programme Specific Outcomes (PSOs)

On successful completion of the program, the graduates of B. Tech. (Computer Science and Engineering) program will be able to:

- **PSO-1**: Demonstrate the knowledge of Data structures and Algorithms, Operating Systems, Database Systems, Software Engineering, Programming Languages, Digital systems, Theoretical Computer Science, and Computer Networks,cloud computing and artificial intelligence.
- **PSO-2**: Solve latest problems and develop code to address the requirements of Industry through programming.
- **PSO-3:** Use modern tools and techniques in the area of Computer Science and Engineering.

B. TECH IN COMPUTER SCIENCE AND ENGINEERING

Scheme of Instructions

(Effective from Academic Year 2021 - 22)

I SEMESTER (CYCLE-1)

Sl. No	Course Code	Title of the Course	HC/FC/SC/OE /MC	Credit Pattern & CreditValue				Contact Hours / Week
				L	T	P	Credits	
1	B20AS0105	Multivariable Calculus and Linear Algebra	HC	3	0	0	3	3
2	B20AS0106	Physics for Computer Science	HC	3	0	0	3	3
3	B20CS0101	Introduction to Data Science	FC	2	0	1	3	4
4	B20CS0102	Programming for Problem Solving	HC	3	0	1	4	5
TOTAL				11	0	2	13	15
	Practical /Term Work / Practice Sessions/Online /MOOC							
5	B20ME0104	Entrepreneurship	HC	1	0	0	1	1
6	B20EC0101	IoT Applications	FC	1	0	1	2	3
7	B20ME0101	Computer Aided Engineering Drawing	HC	2	0	1	3	4
TOTAL				4	0	2	6	8
TOTAL SEMESTER CREDITS							19	
TOTAL CUMULATIVE CREDITS							19	
TOTAL CONTACT HOURS							23	

II SEMESTER (CYCLE-2)

Sl. No	Course Code	Title of the Course	HC/FC/SC/ OE/MC	Credit Pattern & Credit Value				Contact Hours/ Week
				L	T	P	Credits	
1	B20AS0204	Probability and Statistics	HC	4	0	0	4	4
2	B20AS0104	Engineering Chemistry	HC	3	0	0	3	3
3	B20CI0101	Introduction to Python Programming	FC	2	0	1	3	4
4	B20EE0101	Basics of Electrical and Electronics Engineering	HC	3	0	1	4	5
5	B20CE0201	Basics of Civil and Mechanical Engineering	HC	3	0	1	4	5
TOTAL				15	0	3	18	21
	Practical /Term Work / Practice Sessions/Online/MOOC							
6	B20AS0109	Biology for Engineers	FC	1	0	0	1	1
7	B20ME0102	Design Thinking	HC	1	0	1	2	3
TOTAL				2	0	1	3	4
TOTAL SEMESTER CREDITS							21	
TOTAL CUMULATIVE CREDITS							40	
TOTAL CONTACT HOURS							25	

III SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/SC/OE/ MC	Credit Pattern & Credit Value				Contact Hours/ Week
				L	T	P	Credits	
1	B20EF0301	Analog and Digital Electronics	HC	3	0	0	3	3
2	B20EF0302	Programming with JAVA	HC	3	0	0	3	3
3	B20EF0303	Data Structures	HC	3	0	0	3	3
4	B20AS0302	Discrete Mathematics and Graph Theory	HC	3	0	0	3	3
5	B20EF0304	Agile software development and DevOps	HC	3	0	0	3	3
TOTAL				15	0	0	15	15
	Practical /Term Work / Practice Sessions/Online/MOOC							
6	B20EF0305	Analog and Digital Electronics lab	HC	0	0	1	1	2
7	B20EF0306	Programming with JAVA lab	HC	0	0	1	1	2
8	B20EF0307	Data Structures lab	HC	0	0	1	1	2
9	B20AH0301	Communication Skills	FC	2	0	0	2	2
10	B20LS0301	Indian Constitution and Professional Ethics	FC	2	0	0	2	2
11	B20AHM301/ B20AHM302	Advanced Kannada/ Basics of Kannada	MC	0	0	0	0	2
TOTAL				4	0	3	7	12
TOTAL SEMESTER CREDITS							22	
TOTAL CUMULATIVE CREDITS							62	

TOTAL CONTACT HOURS	27

IV SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/SC/OE/ MC	Credit Pattern & Credit Value				Contact Hours/ Week
				L	T	P	Credits	
1	B20EF0401	Design and Analysis of Algorithms	HC	3	0	0	3	3
2	B20EF0402	Unix Operating System	HC	3	0	0	3	3
3	B20EF0403	Database Management System	HC	3	0	0	3	3
4	B20EF0404	Computer Organization and Architecture	HC	3	0	0	3	3
5	B20AS0401	Numerical Methods and Optimization Techniques	HC	3	0	0	3	3
TOTAL				15	0	0	15	15
	Practical /Term Work / Practice Sessions/Online/MOOC							
6	B20EF0405	Unix Operating System lab	HC	0	0	1	1	2
7	B20EF0406	Database Management System lab	HC	0	0	1	1	2
8	B20EF0407	Computer Organization and Architecture lab	HC	0	0	1	1	2
9	B20MGM301	Management Science	FC	2	0	0	2	2
10	B20AS0303	Environmental Science	FC	2	0	0	2	2
11	B20AHM401	Universal Human Values	MC	0	0	0	0	2
TOTAL				4	0	3	7	12
TOTAL SEMESTER CREDITS							22	

TOTAL CUMULATIVE CREDITS	84
TOTAL CONTACT HOURS	27

V SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/SC/OE/ MC	Credit Pattern & Credit Value				Contact Hours/ Week
				L	T	P	Credits	
1	B20EF0501	Web Technologies	HC	3	0	0	3	3
2	B20EF0502	Computer Networks	HC	3	0	0	3	3
3	B20EF0503	Machine Learning	HC	3	0	0	3	3
4	B20EFS511-516	Professional Elective-I	SC	3	0	0	3	3
5	B20EFS517-522	Professional Elective-II	SC	3	0	0	3	3
6	B20XXO5XX	Open Elective-I	OE	3	0	0	3	3
TOTAL				18	0	0	18	18
	Practical /Term Work / Practice Sessions/Online/MOOC							
7	B20EF0504	Modern Databases	HC	2	0	0	2	2
8	B20EF0505	Web Technologies Lab	HC	0	0	1	1	2
9	B20EF0506	Computer Networks lab	HC	0	0	1	1	2
10	B20EF0507	Machine Learning lab	HC	0	0	1	1	2
11	B20EF0508	Modern Databases lab	HC	0	0	1	1	2
12	B20PA0501	Indian Tradition and Culture	FC	1	0	0	1	1
13	B20EF0509	Skill development-1	HC	0	0	0	2	4
TOTAL				3	0	4	9	15
TOTAL SEMESTER CREDITS							27	
TOTAL CUMULATIVE CREDITS							111	

TOTAL CONTACT HOURS	33

VI SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/SC/OE/ MC	Credit Pattern & Credit Value				Contact Hours/ Week
				L	T	P	Credits	
1	B20EF0601	Theory of Computation	HC	3	0	0	3	3
2	B20EF0602	Big Data and Cloud Computing	HC	3	0	0	3	3
3	B20EFS611-614	Professional Elective-III	SC	3	0	0	3	3
4	B20EFS615-618	Professional Elective-IV	SC	3	0	0	3	3
5	B20XXO6XX	Open Elective-II	OE	3	0	0	3	3
TOTAL				15	0	0	15	15
Practical /Term Work / Practice Sessions/Online/MOOC								
6	B20EF0603	Research Based Mini Project	HC	0	0	2	2	4
7	B20EF0604	Mobile Application Development	HC	1	0	0	1	1
8	B20EF0605	Big Data and Cloud Computing lab	HC	0	0	1	1	2
9	B20EF0606	Mobile Application Development lab	HC	0	0	1	1	2
10	B20EF0607	Technical Documentation	FC	1	0	0	1	1
11	B20EF0608	Skill development-2	HC	0	0	0	2	4
TOTAL				2	0	4	8	14
TOTAL SEMESTER CREDITS							23	
TOTAL CUMULATIVE CREDITS							134	
TOTAL CONTACT HOURS							29	

VII SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/SC/OE/MC	Credit Pattern & Credit Value				Contact Hours/ Week
				L	T	P	Credits	
1	B20EFS711-713	Professional Elective-V	SC	3	0	0	3	3
2	B20XXO7XX	Open Elective-III	OE	3	0	0	3	3
TOTAL				6	0	0	6	6
Practical /Term Work / Practice Sessions/Online/MOOC								
3	B20EF0701	Capstone-Project Phase-1	HC	0	0	1	1	2
4	B20EF0702	Internship/Global Certification	HC	0	0	3	3	6
TOTAL				0	0	4	4	8
TOTAL SEMESTER CREDITS							10	
TOTAL CUMULATIVE CREDITS							144	
TOTAL CONTACT HOURS							14	

VIII Semester

Sl. No	Course Code	Title of the Course	HC/FC/SC/OE /MC	Credit Pattern & Credit Value				Contact Hours/ Week
				L	T	P	Credits	
1	B20EF0801	Capstone-ProjectPhase-2	HC	0	0	7	7	14
2	B20EF0802	Internship/Global Certification	HC	0	0	3	3	6
3	B20EF0803	MOOC / Competitive Exam	HC	0	0	3	3	6
TOTAL				0	0	13	13	26
Practical /Term Work / Practice Sessions/Online/MOOC								
4	B20XXO8XX	Open Elective-IV	OE	3	0	0	3	3
TOTAL				3	0	0	3	3
TOTAL SEMESTER CREDITS							16	
TOTAL CUMULATIVE CREDITS							160	
TOTAL CONTACT HOURS							29	