SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

BOARD OF STUDIES IN COMPUTER SCIENCE &ENGINEERING

B.E. III & IV Semester

Computer Science & Engineering

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER: FIRST/SECOND "GROUP A"

Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D	Total Hours/Week	Credit	Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
Theory																
1	1A1	Engineering Mathematics - I	3	1		4	4	3	80	20	100	40				
2	1A2	Engineering Physics	4			4	4	3	80	20	100	40				
3	1A3	Engineering Mechanics	3	1		4	4	3	80	20	100	40				
4	1A4	Computer Programming	3			3	3	4	80	20	100	40				
Practicals																
5	1A5	Workshop Practice			4	4	2						25	25	50	25
6	1A6	Engineering Physics Laboratory			2	2	1						25	25	50	25
7	1A7	Engineering Mechanics Laboratory			2	2	1						25	25	50	25
8	1A8	Computer Programming Laboratory			2	2	1						25	25	50	25
		Total	**13**	**2**	**10**	**25**	**20**				**400**				**200**	
														Total	**600**	

Three Week Induction Program to be undertaken as suggested by AICTE

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER: FIRST/SECOND "GROUP B"

Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D	Total Hours/Week	Credit	Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
Theory																
1	1B1	Engineering Mathematics - II	3	1		4	4	3	80	20	100	40				
2	1B2	Engineering Chemistry	4			4	4	3	80	20	100	40				
3	1B3	Basic Electrical Engineering	3	1		4	4	3	80	20	100	40				
4	1B4	Engineering Graphics	3			3	3	3	80	20	100	40				
Practicals																
5	1B5	English Communication Skill Lab			4	4	2						25	25	50	25
6	1B6	Engineering Chemistry Laboratory			2	2	1						25	25	50	25
7	1B7	Basic Electrical Engineering Lab			2	2	1						25	25	50	25
8	1B8	Engineering Graphics Laboratory			2	2	1						25	25	50	25
		Total	**13**	**2**	**10**	**25**	**20**				**400**				**200**	
														Total	**600**	

Teaching Scheme | Examination Scheme (Theory, Practical — Max Marks)

Three Week Induction Program to be undertaken as suggested by AICTE

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER: THIRD

Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D	Total Hours/Week	Credit	Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
Theory																
1	3KS01	Mathematics-III	3	1		4	4	3	80	20	100	40				
2	3KS02	Discrete Structure & Graph Theory	3			3	3	3	80	20	100	40				
3	3KS03	Object Oriented Programming	3			3	3	3	80	20	100	40				
4	3KS04	Data Structures	3			3	3	3	80	20	100	40				
5	3KS05	Analog & Digital Electronics	3			3	3	3	80	20	100	40				
6	4ES06	Environmental Studies *	2			2	0									
Practicals																
7	3KS06	Object Oriented Programming (Java) Lab			2	2	1						25	25	50	25
8	3KS07	Data Structures Lab			2	2	1						25	25	50	25
9	3KS08	Analog & Digital Electronics Lab			2	2	1						25	25	50	25
10	3KS09	C Skill-Lab I (#)			2	2	1						25	25	50	25
		Total	**17**	**1**	**8**	**26**	**20**			**500**					**200**	
														Total	**700**	

* As per the Ordinance No. 42 of 2005

\# C Skill Lab I - based on technology like -**Python/Django** etc. to be decided by Individual Dept. of respective College

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER: FOURTH

Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D	Total Hours/Week	Credit	Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
				Hours per Week					Theory					Practical Max Marks		
Theory																
1	4KS01	Artificial Intelligence	3			3	3	3	80	20	100	40				
2	4KS02	Data Communication & Networking	3			3	3	3	80	20	100	40				
3	4KS03	Operating System	3			3	3	3	80	20	100	40				
4	4KS04	Microprocessor & Assembly Lang. Prog.	3			3	3	3	80	20	100	40				
5	4KS05	Theory of Computation	3	1		4	4	3	80	20	100	40				
6	4ES06	Environmental Studies *	2			2	2	3	80	20	100	40				
Practicals																
7	4KS06	Data Communication & Networking Lab			2	2	1						25	25	50	25
8	4KS07	Operating System Lab			2	2	1						25	25	50	25
9	4KS08	Microprocessor & Assembly Lang. Prog. Lab			2	2	1						25	25	50	25
10	4KS09	C Skill-Lab II (#)			2	2	1						25	25	50	25
		Total	**17**	**1**	**8**	**26**	**22**				**600**				**200**	
											Total				**800**	

* As per the Ordinance No. 42 of 2005

\# C Skill Lab II - based on technology like -**PHP, Web Technology, Raspberry Pi/Ardino**, etc. to be decided by Individual Dept. of respective College

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER: FIFTH

Sr No	Subject Code	Subject Name	Teaching Scheme — Hours/Week — Lecture	Tutorial	P/D	Total Hours/Week	Credit	Theory — Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	Practical — Max Marks — External	Internal	Total	Min Passing Marks
Theory																
1	5KS01	Database Management Systems	4			4	4	3	80	20	100	40				
2	5KS02	Compiler Design	3			3	3	3	80	20	100	40				
3	5KS03	Computer Architecture & Organization	3			3	3	3	80	20	100	40				
4	5KS04	Professional Elective-I (#)	3			3	3	3	80	20	100	40				
5	5KS05	Open Elective - I ($)	3			3	3	3	80	20	100	40				
Practicals																
6	5KS06	Database Management Systems Lab (@)			2	2	1						25	25	50	25
7	5KS07	Compiler Design Lab			2	2	1						25	25	50	25
8	5KS08	Emerging Technology Lab# I			2	2	1						25	25	50	25
9	5KS09	C Skill Lab III (*)			2	2	1						25	25	50	25
		Total	**16**	**0**	**8**	**24**	**20**				**500**				**200**	
														Total	**700**	

Track	# Professional Elective-I
AI	Cognitive Technologies
DS	Data Science and Statistics
IoT	Internet of Things
Cy. Security	Introduction to Cyber Security

$ Open Elective - I
Fundamentals of Finance & Accounting
Principles of Marketing for Engineering
Entrepreneurship

@ Practicals using MongoDB,MySQL

FOSS Tools & Technology for Practicals

Track	Emerging Technology Lab# I
AI	IBM Watson, Microsoft Cognitive Toolkit , TensorFlow, Apache SystemML, Caffe, OpenNN, Torch, Neuroph
DS	R, Python, Cassandra, Apache Hadoop
IoT	Arduino, DeviceHive, Kaa, Home Assistant
CS	Kali Linux, OpenVPN, NMAP, Metasploit Framework

* C Skill Lab III - based on technology like - **Angular & React, Express, Node.js** etc. to be decided by Individual Dept. of respective College

An Orientation Program of 15 hours duration /MOOC on <u>Indian Constitution</u> *to be offered to the students during the Vth Semester*

Open Elective I to be opted from the courses offered by other engineering technology boards of the university /Massive Open learning Courses (MOOC) such as SWAYAM pertaining to the profession

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
FOUR YEAR DᴇGᴇᴇ COURSE IN BACHELOR OF ENGINEERING
BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER: SIXTH

Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D	Total Hours/Week	Credit	Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
Theory																
1	6KS01	Security Policy & Governance	3			3	3	3	80	20	100	40				
2	6KS02	Design & Analysis of Algorithm	4			4	4	3	80	20	100	40				
3	6KS03	Software Engineering	3			3	3	3	80	20	100	40				
4	6KS04	Professional Elective-II (#)	3			3	3	3	80	20	100	40				
5	6KS05	Open Elective - II ($)	3			3	3	3	80	20	100	40				
Practicals																
6	6KS06	Design & Analysis of Algorithm Lab			2	2	1						25	25	50	25
7	6KS07	Software Engineering Lab		v	2	2	1						25	25	50	25
8	6KS08	Emerging Technology Lab# II			2	2	1						25	25	50	25
9	6KS09	C Skill Lab IV (*)			2	2	1						25	25	50	25
		Total	**16**		**8**	**24**	**20**				**500**				**200**	
										Total				**Total**	**700**	

Track	# Professional Elective-II
AI	Natural Language Processing
DS	Big Data Analytics
IoT	Sensors & Actuators
Cy.Security	Cryptography

$ Open Elective - II
Computational Biology
Cyber Law & Ethics
Intellectual Property Right

FOSS Tools & Technology for Practicals

Track	Emerging Technology Lab# II
AI	Natural Language Toolkit (NLTK),SpaCy, PyTorch-NLP, Natural, Retext, TextBlob
DS	KNIME, Spark, Neo4J, MongoDB, Hive, Storm,
IoT	Devicehub, Zetta, Node-RED, Flutter, M2MLabs Mainspring
CS	VeraCrypt, ModSecurity, AdBlocker, CheckShortURL, SPAMfighter, SpamBully

* C Skill Lab IV - based on technology like - **DevOp to be decided by Individual Dept. of respective College**

An Orientation Program of 15 hours duration /MOOC on <u>Indian Constitution</u> to be offered to the students during the Vth Semester

Open Elective II to be opted from the courses offered by other engineering technology boards of the university /Massive Open learning Courses (MOOC) such as SWAYAM pertaining to the profession

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER: SEVENTH

Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D	Total Hours/Week	Credit	Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
Theory																
1	7KS01	Social Science & Engineering Economics	3			3	3	3	80	20	100	40				
2	7KS02	Computer Graphics	3			3	3	3	80	20	100	40				
3	7KS03	Cloud Computing	4			4	4	3	80	20	100	40				
4	7KS04	Professional Elective-III (#)	3			3	3	3	80	20	100	40				
5	7KS05	Professional Elective-IV ($)	3			3	3	3	80	20	100	40				
Practicals																
6	7KS06	Computer Graphics Lab			2	2	1						25	25	50	25
7	7KS07	Emerging Technology Lab# III			2	2	1						25	25	50	25
8	7KS08	Emerging Technology Lab# IV			2	2	1						25	25	50	25
9	7KS09	Project & Seminar			8	8	4							50	50	25
		Total	**16**		**14**	**30**	**23**				**500**				**200**	
		Total												**Total**	**700**	

Track	# Professional Elective-III
AI	Robotics
DS	Data Warehousing & Mining
IoT	Embedded Systems
Cy.Security	Digital Forensics

Emerging Technology Lab# III
ROS, YARP, MRPT, Gazebo, OROCOS.
RapidMiner, Weka, Scrapy, Pandas
ThingsBoard, Kinoma, SiteWhere
Security Onion, LastPass,KeePAss

Emerging Technology Lab# V
Ethereum,BigchainDB, Corda
OpenCV, SimpleCV, Keras, Caffe
OpenEaagles, Repast, OpenSimulator

← FOSS Tools & Technology for Practicals ↑

$ Professional Elective-IV	Blockchain Fundamentals	Image Processing	Optimization Techniques

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)SEMESTER:
EIGHTH

Sr No	Subject Code	Subject Name	Teaching Scheme					Examination Scheme									
			Hours per Week			Total Hours/Week	Credit	Theory					Practical			
			Lecture	Tutorial	P/D			Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	Max Marks			Min Passing Marks
													External	Internal	Total	
Theory																
1	8KS01	Object Oriented Analysis & Design	3			3	3	3	80	20	100	40				
2	8KS02	Professional Ethics & Management	3			3	3	3	80	20	100	40				
3	8KS03	Professional Elective-V (#)	3			3	3	3	80	20	100	40				
4	8KS04	Professional Elective-VI ($)	3			3	3	3	80	20	100	40				
Practicals																
5	8KS05	Emerging Technology Lab# V			2	2	1						25	25	50	25
6	8KS06	Emerging Technology Lab# VI			2	2	1						25	25	50	25
7	8KS07	Project & Seminar			12	12	6						75	75	150	75
		Total	**12**		**16**	**28**	**20**				**400**				**250**	
														Total	**650**	

Track	# Professional Elective-V
AI	Virtual & Augmented Reality
DS	Machine Learning and AI
IoT	Wireless Sensor Networks
Cy.Security	System & Software Security

Emerging Technology Lab# IV
Google's ARCore, AR.js, ARToolKit, DroidAR, Brio, Adobe Aero
R Studio, Orange, D3.js, Ggplot2, Jupyter Notebooks
DSA,Thinger,RIOT, OpenRemote,Anjay
Wireshark, Burp Suit, Nessus

Emerging Technology Lab# VI
Hyperledger, HydraChain, MultiChain, Elements
Google Colab, GPUImage, Cuda, Aforge/Accord.NET
OR-Tools, Locust.io, httperf, Apache JMeter, Siege

← **FOSS Tools & Technology for Practicals** ↑

$ Professional Elective-VI	Distributed Ledger Technology	Multimedia Computing	Modeling & Simulation

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FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH: COMPUTER SCIENCE & ENGINEERING

Baskets for Open Electives & Professional Electives

Open Elective - I	Open Elective - II
Fundamentals of Finance & Accounting	Computational Biology
Principles of Marketing for Engineering	Cyber Law & Ethics
Entrepreneurship	Intellectual Property Right

Track	Professional Elective-IV		Professional Elective-VI
	Blockchain Fundamentals		Distributed Ledger Technology
	Image Processing		Multimedia Computing
	Statistics using R		Modeling & Simulation

Track	Professional Elective-I		Professional Elective-II
AI	Cognitive Technologies		Natural Language Processing
DS	Data Science		Big Data Analytics
IoT	Internet of Things		Sensors & Actuators
Cyber Security	Introduction to Cyber Security		Cyptography

Track	Professional Elective-III		Professional Elective-V
AI	Robotics		Virtual & Augmented Reality
DS	Data Warehousing & Mining		Machine Learning and AI
IoT	Embedded Systems		Wireless Sensor Networks
Cyber Security	Digital Forensics		System & Software Security

Specialization option can be supported by Professional Electives I, II, III, IV, V & VI can also be opted through SWAYAM which needs to be mentored by Faculty.

C Skill Lab I - IV covers the technology essentials for *Full Stack Developer* Skill set

Wherever possible students should be encouraged to opt for Virtual Labs apart from the normal Physical Labs for all the subjects specifically from Professional electives baskets. (Various Virtual Labs were floated by Ministry of HRD http://www.vlab.co.in/)

Tentative FOSS Tools & Technology for Practicals
(Free and open-source software)

Track	Emerging Technology Lab#1
AI	IBM Watson, Microsoft Cognitive Toolkit, TensorFlow, Apache SystemML, Caffe, OpenNN, Torch, Neuroph
DS	R, Python, Cassandra, Apache Hadoop,
IoT	Arduino, DeviceHive, Kaa, Home Assistant
Cyber Security	Kali Linux, OpenVPN, NMAP, Metasploit Framework

Track	Emerging Technology Lab#2
AI	Natural Language Toolkit (NLTK),SpaCy, PyTorch-NLP, Natural, Retext, TextBlob
DS	KNIME, Spark, Neo4J, MongoDB, Hive, Storm,
IoT	Devicehub, Zetta, Node-RED, Flutter, M2MLabs Mainspring
Cyber Security	VeraCrypt, ModSecurity, AdBlocker, CheckShortURL, SPAMfighter, SpamBully

Track	Emerging Technology Lab#3
AI	ROS, YARP, MRPT, Gazebo, OROCOS.
DS	RapidMiner, Weka, Scrapy, Pandas
IoT	ThingsBoard, Kinoma, SiteWhere
Cyber Security	Security Onion, LastPass,KeePAss

Track	Emerging Technology Lab#4
AI	Google's ARCore, AR.js, ARToolKit, DroidAR, Holokit. Mixare, Brio, Adobe Aero
DS	R Studio, Orange, D3.js, Ggplot2, Jupyter Notebooks
IoT	DSA,Thinger,RIOT, OpenRemote,Anjay
Cyber Security	Wireshark, Burp Suit, Nessus

Track	Emerging Technology Lab# V
Block Chain	Ethereum,BigchainDB, Corda
Image Processing	OpenCV, SimpleCV, Keras, Caffe
Optimization	OpenEaagles, Repast, OpenSimulator

Track	Emerging Technology Lab# VI
Block Chain	Hyperledger, HydraChain, MultiChain, Elements
Image Processing	Google Colab, GPUImage, Cuda, AForge.NET/Accord.NET
Optimization	OR-Tools, Locust.io, httperf, Apache JMeter, Siege