w.e.f. 2021-22

VR20

B. Tech.

Honor

in

ARTIFICIAL INTELLIGENCE & DATA SCIENCE

SCHEME OF INSTRUCTION & SYLLABUS

Effective from 2022-23

Department of Artificial Intelligence & Data Science

VELAGAPUDI RAMAKRISHNA

SIDDHARTHA ENGINEERING COLLEGE

(An Autonomous, ISO 9001:2015 Certified Institution)

(Approved by AICTE, Accredited by NAAC with 'A' Grade, Affiliated to JNTUK, Kakinada)

(Sponsored by Siddhartha Academy of General & Technical Education)

Kanuru, Vijayawada

Andhra Pradesh - 520007, INDIA.

www.vrsiddhartha.ac.in

INSTITUTE VISION

To nurture excellence in various fields of engineering by imparting timeless core values to the learners and to mould the institution into a centre of academic excellence and advanced research.

INSTITUTE MISSION

To impart high quality technical education in order to mould the learners into globally competitive technocrats who are professionally deft, intellectually adept and socially responsible. The institution strives to make the learners inculcate and imbibe pragmatic perception and pro-active nature so as to enable them to acquire a vision for exploration and an insight for advanced enquiry.

DEPARTMENT VISION

The department vision is clearly defined and is in line with the college's vision. The vision of the department is:

"To evolve as a centre of academic excellence, advanced research and innovation in the field of Artificial Intelligence and Data Science discipline."

DEPARTMENT MISSION

This mission of the Department is concise and supports the College's mission. The mission of Artificial Intelligence and Data Science Department is:

"To inculcate students with congnitive skills to perform intelligent data analysis, their application in solving data driven problems, with an inclination towards societal issues, research, professional career and higher studies ."

Program Educational Objectives(UG)

We have program educational objectives for our Artificial Intelligence and Data Science Program. Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

Our program educational objectives are:

I. The graduates of the Program will have knowledge and skills for data analysis, including mathematics, science and basic engineering.

II. The graduates of the Program will have in-depth learning skills to function as members of multi-disciplinary teams and to communicate effectively using modern tools.

III. The graduates of the Program will have extensive knowledge in state-ofthe- art frameworks in Artificial Intelligence and be prepared for their careers in the software industry or pursue higher studies and continue to develop their professional knowledge.

IV. The graduates of the program will practice the profession with ethics, integrity, leadership and social responsibility

PROGRAM OUTCOMES

On successful completion of the B.Tech (AI&DS) programme the student will be able to :

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering, data science fundamentals, and artificial intelligence to solve complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature and analyze complex engineering problems to create solutions using the first principles of mathematics, engineering sciences, and data science.

PO3: Design/development of solutions: Design solutions Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Apply research methods including design of experiments, statistical analysis and business interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate Artificial intelligence principles, techniques, modern engineering and IT tools including prediction and modelling to model complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning using contextual knowledge to assess the needs of societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to data science engineering practice.

PO7: Environment and sustainability: Understand the impact of artificial intelligence solutions in societal and environmental contexts, and

demonstrate the knowledge for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and to execute responsibilities and adhere to norms of the engineering profession.

PO9: Individual and team work: Execute professional functions effectively as an individual, as well as a leader or member in diverse multidisciplinary

teams.

PO10: Communication: Communicate effectively with the engineering community and with society in solving complex problems in terms of being able to comprehend and write effective reports, make effective presentations, as well as execute and receive clear instructions.

PO11: Project management and finance: Demonstrate an ability to use management principles and apply these to one's own work, as a member and lead projects and build cost models in an interdisciplinary professional setting.

PO12: Lifelong learning: Recognize the need for and develop learning mechanisms and inculcate the ability to prepare for lifelong learning in the context of technological change.

PROGRAM SPECIFIC OUTCOMES

PSO1: Develop AI based software applications/solutions as per the needs of Industry and society

PSO2: Adopt new and fast emerging technologies in Artificial Intelligence and Data Science

CURRICULAR FRAMEWORK FOR HONOR PROGRAM

1. Students of a Department/Discipline are eligible to opt for Honors Program offered by the same Department/Discipline.

2. A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired ≥ 08 CGPA without backlogs upto end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required ≥ 08 CGPA without backlogs, his/her registration for Honors Program stands cancelled and he/she shall continue with the regular Program.

3. Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.

4. In addition to fulfilling all the requisites of a Regular B.TechProgram, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

5. Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of studies.

6. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.

7. The concerned BoS shall decide on the minimum enrolments (20) for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

8. Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall explore the possibility of introducing virtual labs for such courses with lab component. (Model pool list is enclosed in the Annexure-2)

9. MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the

agencies approved by the BOS with grading or marks or pass/fail in order to earn 1credit for 4 week course. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the College/academic council.

10. The concerned BoS shall also consider courses listed under professional electives of the respective B. Tech programs for the requirements of B. Tech (Honors). However, a student shall be permitted to choose only those courses that he/she has not studied in any form during the Program.

11. If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

12. In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

13. Honors must be completed simultaneously with a major degree program without exceeding 8 credits per semester. A student cannot earn Honors after he/she has already earned bachelor's degree.

HONOR DEGREE IN AI&DS

Advanced Data Analytics							
S. No	***Course Code***	***Course Name***	***Offered in Sem***	***L***	***T***	***P***	***Credits***
1	20AI&DSH4801A	Advanced Python Programming	IV	3	1	0	4
2	20AI&DSH5801A	High Dimensional Data Analysis	V	3	1	0	4
3	20AI&DSH6801A	Artificial Intelligence for Robotics	VI	3	1	0	4
4	20AI&DSH7801A	AI in security applications	VII	3	1	0	4
02MOOCScourses@2creditseachother than the courses listed above needs to Be taken) (Any CSE/IT related Program Core subject from NPTEL/ SWAYAM course of 8weeks Any other course or platform deemed essential and approved by the Head of the Department							**4**
						Grand Total	**20**

HONOR DEGREE IN AI&DS

FullStack Web Development							
S. No	***Course Code***	***Course Name***	***Offered in Sem***	***L***	***T***	***P***	***Credits***
1	20AI&DSH4801B	Frontend Technologies	IV	3	1	0	4
2	20AI&DSH5801B	MEAN Technologies	V	3	1	0	4
3	20AI&DSH6801B	Backend Technologies	VI	3	1	0	4
4	20AI&DSH7801B	Framework & Micro services	VII	3	1	0	4
02MOOCScourses@2creditseachother than the courses listed above needs to Be taken) (Any CSE/IT related Program Core subject from NPTEL/ SWAYAM course of 8weeks Any other course or platform deemed essential and approved by the Head of the Department							**4**
						Grand Total	**20**

SEMESTER IV

20AI&DSH4801A
ADVANCED PYTHON PROGRAMMING

Course Category:	Honors	**Credits:**	4
Stream/ Course Type:	Advanced Data Analytics/ Theory	**Lecture -Tutorial-Practice:**	3-1-0
Prerequisites:	20AI&DS3305: Data Structures & Algorithms	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Apply Python arrays and computer graphics libraries to perform data exploration and visualization.	K3	1.7.1, 2.5.1, 2.5.2, 2.5.3, 2.8.2, 3.5.1, 3.6.1, 3.8.2
CO2	Apply Python packages to solve problems related to file input/output, database access and data analysis.	K3	1.7.1, 2.5.1, 2.5.2, 2.5.3, 2.8.2, 3.5.1, 3.6.1, 3.8.2
CO3	Apply different Python libraries to implement data concurrency, parallelism, asynchronous and network programming.	K3	1.7.1, 2.5.1, 2.5.2, 2.5.3, 2.8.2, 3.5.1, 3.6.1, 3.8.2
CO4	Apply Scipy and SciKit Python libraries to perform scientific computations.	K3	1.7.1, 2.5.1, 2.5.2, 2.5.3, 2.8.2, 3.5.1, 3.6.1, 3.8.2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**1**	**2**	**2**										**3**	**3**
CO2	**1**	**2**	**2**										**3**	**3**
CO3	**1**	**2**	**2**										**3**	**3**
CO4	**1**	**2**	**2**										**3**	**3**

COURSE CONTENT

UNIT I

Arrays with Numpy: Creating an Array, Mathematical Operations, Squaring an Array, Indexing and Slicing, Shape Manipulation

Computer Graphics: Introduction to Computer Graphics, Python Turtle Graphics, Creating Computer Art, Introduction to Matplotlib, Graphing with Matplotlib pyplot, Graphical User Interfaces, The wxPython GUI Library, Events in wxPython User Interfaces, PyDraw wxPython Example Application

UNIT II

File Input/output : Introduction to Files, Paths and IO, Reading and Writing Files, Stream IO, Working with CSV Files, Working with Excel Files

Database Access: Introduction to Databases, Python DB-API, PyMySQL Module

Data Analysis with Pandas: The data structure of Pandas: Series, Data Frame, Panel; Inserting and Exploring data: CSV, XLS, JSON, Database.

UNIT III

Concurrency and Parallelism: Introduction to Concurrency and Parallelism, Threading, Multiprocessing, Inter Thread/Process Synchronisation, Futures, Concurrency with AsyncIO.

Asynchronous Programming: Reactive Programming Introduction, RxPy Observables, Observers andSubjects, RxPy Operators

Network Programming: Introduction to Sockets, Sockets in Python

UNIT IV

Computation Using Scipy: Optimization and Minimization, Interpolation, Integration, Statistics, Spatial and Clustering Analysis, Signal and Image Processing, Sparse Matrices, Reading and Writing Files.

SciKit: Going One Step Further: Scikit Image: Dynamic Threshold, Local Maxima; Scikit-Learn: Linear Regression and Clustering.

TEXT BOOKS

[1] Madhavan, S. (2015). Mastering Python for Data Science. Packt Publishing Ltd.

[2] Hunt, J. (2019). Advanced Guide to Python 3 Programming. Springer.
[3] Bressert, E. (2012). SciPy and NumPy: an overview for developers. O'REILLY.

REFERENCE BOOKS

[1] Jaworski, M., & Ziadé, T. (2016). Expert Python Programming. Packt Publishing Ltd.
[2] Pichara, K., & Pieringer, C. (2017). Advanced Computer Programming in Python. CreateSpace Independent Publishing Platform.
[3] Lanaro, G., Nguyen, Q., & Kasampalis, S. (2019). Advanced Python Programming. Packt Publishing Ltd.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] *Advanced Python Programming Training Course | Koenig Solutions*. (z.d.). Koenig-Solutions. -Com. https://www.koenig-solutions.com/python-programming-training
[2] Advanced *Python Programming Training - Accelebrate*. (z.d.). Accelebrate. Geraadpleegd op 21 maart 2022, van https://www.accelebrate.com/training/python-advanced
[3] Advanced *Python with Project work and Internship (Recorded Lectures)*. (z.d.). ICT Academy at IITK. Geraadpleegd op 21 maart 2022, van https://ict.iitk.ac.in/product/advanced-python/

20AI&DSH4801B
FRONTEND TECHNOLOGIES

Course Category:	Honors	**Credits:**	4
Stream/ Course Type:	Full Stack and Web Develpment/ Theory	**Lecture -Tutorial-Practice:**	3-1-0
Prerequisites:	20AI&DS4303: Advanced Java Programming	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	*Understand* the fundamentals of HTML5 and CSS3.	K1	1.7.1,2.5.1,2.5.2
CO2	*Apply* XML and Java Script on a given web application.	K3	1.7.1,2.5.1,2.5.2, 2.6.3,2.7.1,3.5.1,
CO3	*Create a* front end web application using TypeScript.	K3	1.7.1,2.5.1, 2.5.2,2.6.3,2.6.4 3.5.1,
CO4	*Develop* a front end web application using React.	K3	1.7.1,2.5.1, 2.5.2,2.6.3,2.6.4, 3.5.1,4.6.2,5.4.2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**	**2**												
CO2	**2**	**2**	**3**										**2**	**2**
CO3	**2**	**2**	**3**										**2**	**2**
CO4		**2**	**3**	**2**									**2**	**2**

COURSE CONTENT

UNIT I

Overview of HTML5: Internet and Web, Exploring new features of HTML5, HTML5- Next Generation of Web development, Structuring an HTML Document, Exploring Editors and Browsers Supported by HTML5,Creating and Saving an HTML Document, Validating an HTML Document, Viewing an HTML Document,Hosting Web Pages. Fundamentals of HTML, Working with Text, Links and URLs, Creating Tables, Working with Images, Colors and Canvas, Working with Forms, Frames and Multimedia.

Overview of CSS3: Discussing the Evolution of CSS, Understanding the Syntax of CSS, Exploring CSS Selectors, Inserting CSS in an HTML DocumentCreating and Using a Simple External CSS File

Using the Internal and Inline CSS Styles, Fonts and Text styles, Creating Boxes and Columns Using CSS,Displaying, Positioning and Floating an Element,Effects, Frames and Controls in CSS

UNIT II

Working with Basics of XML: Exploring XML, Comparing XML with HTML, Exploring Advantages and Disadvantages of XML, Describing the Structure of an XML Document, Exploring XML Entity References, Exploring XML Parsers, Describing DTD, Exploring XML Namespaces

Describing an XML Schema, Understanding XML CDATA, Describing Entity References

JavaScript: Overview of JavaScript: Exploring the Features of JavaScript, Using JavaScript in an HTML Document, Exploring Programming Fundamentals of JavaScript, JavaScript Functions, Events, Image Maps and Animations, Working with Document object, Document Object Model

UNIT III

TypeScript: The Type System - TypeScript Versus JavaScript, All About Types: Talking About Types, The ABCs of Types - any, unknown, boolean, number, bigint, string, symbol, Objects, Intermission: Type Aliases-Unions Intersections,Arrays, Tuples, null, undefined, void, and never,Enums.

Functions: Declaring and Invoking Functions, Optional and Default Parameters, Rest Parameters, call, apply, and bind, Typing this, Generator Functions, Iterators, Call Signatures, Contextual Typing, Overloaded Function Types, Polymorphism, When Are Generics Bound?, Where Can You Declare Generics?, Generic Type Inference, Generic Type Aliases, Bounded Polymorphism, Generic Type Defaults, Type-Driven Development.

Classes and Interfaces: Classes and Inheritance, super, Using this as a Return Type, Interfaces, Declaration Merging, Implementations, Implementing Interfaces Versus Extending Abstract Classes, Classes Are Structurally Typed, Classes Declare Both Values and Types, Polymorphism, Mixins, Decorators, Simulating final Classes, Design Patterns, Factory Pattern, Builder Pattern, Handling Errors

UNIT IV

JQuery: Introduction to JQuery, Syntax, Selectors, Events, Effects, JQuery with HTML, Traversing, AJAX.

JSON: Introduction, Syntax, Data types, Parse, Stringify, Objects and Arrays

Overview of React: React Introduction, React ES6, Render HTML, React JSX, React Components, React Props, React Events, React Conditionals, Lists, Forms.

TEXT BOOKS

[1] DT Editorial Services, **"HTML5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, Second Edition",** DreamTech Publishers, January 2016. (Unit I and II)

[2] Boris Cherny "Programming TypeScript - Making Your JavaScript Applications Scale" First Edition, O'REILLY Publications, May 2019. (UNIT-III)

Web References:

[1] Web Reference: https://www.w3schools.com/ (UNIT-IV Chapter 1&2&3)

REFERENCE BOOKS

[1] Julie C Meloni, "HTML, CSS and JavaScript All in One", Second Edition, SAMS Publishers USA.

[2] Developing Web Applications, Ralph Moseley and M. T. Savaliya, Wiley-India

[3] Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel, Pearson

[4] Ethan Brown “Web Development with Node & Express (Leveraging the Java Script Stack), First Edition, OReilly Publications.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Courseera: Jogesh K. Muppala,Associate Professor, The Hong Kong University of Science and Technology Full-Stack Web Development ,The Hong Kong University of Science and Technology
https://www.coursera.org/specializations/full-stack-react#about
[2] Udemy : Brad Traversy, Full Stack Web Developer & Instructor at Traversy Media, MERN Stack Front To Back: Full Stack React, Redux & Node.js
https://www.udemy.com/course/mern-stack-front-to-back/

SEMESTER V

20AI&DSH5801A
HIGH DIMENSIONAL DATA ANALYSIS

Course Category:	Honors	**Credits:**	4
Stream/ Course Type:	Advanced Data Analytics/ Theory	**Lecture -Tutorial-Practice:**	3-1-0
Prerequisites:	20AI&DS4302 Design and Analysis of Algorithms	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand classical High Dimensional problems and Principal Component Analysis	K2	1.2.1, 1.6.1
CO2	Apply factor analysis and grouping techniques on real world problems	K3	1.2.1, 1.7.1, 2.7.1, 2.8.1
CO3	Analyze Non Gaussian analysis	K4	1.2.1, 2.8.1
CO4	Understand Independent component and Feature Selection	K2	1.2.1, 1.6.1

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**1**													
CO2	**2**	**2**												**2**
CO3	**2**	**2**												
CO4	**1**													**2**

COURSE CONTENT

UNIT I

Classical Methods: Classical method, Multivariate and High dimensional problems, Visualization ,Multi variant Random vector and data.

Discriminant Analysis: Visualizing principal component analysis, Properties of principal component, Standardized data and high dimensional data, Asymptotic results, Number of components and regression, Canonical correlation analysis, Population, Sample and properties of canonical correlation, Asymptotic consideration ,Canonical correlation and regression.

UNIT II

Factoring and Grouping: Norms proximities, features, and dualities ,Vectors and matrix norms, measure of proximity ,Features and feature maps, dualities of X and X Transpose ,Cluster analysis ,Hierarchal agglomerative clusters ,3k means clustering, Principal component and cluster analysis ,Factor Analysis, population k factor model, Sample k factor model, Multidimensional scaling, classical scaling, metric scaling and nonmetric scaling.

UNIT III

Non-Gaussian Analysis: Factor Analysis, Population k factor model, Sample k factor model, Multidimensional scaling, Towards Non-Gaussianity, Independent component Analysis, Projection pursuit, Kernal and more independent component methods.

UNIT IV

Feature Selection: Introduction, Independent component and feature selection, Variable Ranking and statistical learning, Sparse principal component analysis, Consistency of principal component analysis as dimension grows.

TEXT BOOKS

[1] Inge Koch , “Analysis of Multivariate and High-Dimensional Data”, Cambridge University Press , 2014

REFERENCE BOOKS

[1] Fatemeh Emdad, Seyed Zekavat , “High Dimensional Data Analysis: Overview, Analysis, and Applications, VDM Verlag, 2008

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://www.edx.org/course/high-dimensional-data-analysis

20AI&DSH5801B
MEAN TECHNOLOGIES

Course Category:	Honors	**Credits:**	4
Stream/ Course Type:	Full Stack and Web Development/ Theory	**Lecture -Tutorial-Practice:**	3-1-0
Prerequisites:	20AI&DS4303: Advanced Java Programming	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	*Understand* an interactive web application using Node.js	K2	1.7.1,2.5.1,2.5.2
CO2	*Apply* Express.js concepts to d*evelop* a dynamic web application	K3	1.7.1,2.5.1,2.5.2, 2.6.3,2.7.1,3.5.1,
CO3	*Apply* MongoDB platform *concepts to create* a web application and connect to database	K3	1.7.1,2.5.1, 2.5.2,2.6.3,2.6.4 3.5.1,
CO4	*Apply* Angular 2 to c*reate* a mean stack web application	K3	1.7.1,2.5.1, 2.5.2,2.6.3,2.6.4, 3.5.1,4.6.2,5.4.2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**	**2**												
CO2	**2**	**2**	**2**										**2**	**2**
CO3	**2**	**2**	**2**										**2**	**2**
CO4	**2**	**2**	**3**	**2**	**2**								**2**	**2**

COURSE CONTENT

UNIT I

Getting Started with Node.js: Introduction to Node.js,Installing Node.js, io.js and the Node.js foundation, Node.js LTS support, Node.js ES6 support, JavaScript event driven programming, Node.js event driven programming.

Node modules: CommonJS modules, Node.jsp core modules, Node.js third party modules, Node.js file modules, Node.js Folder modules.

Developing Node.js web applications: Meet the Connect module, connect middleware, Understanding the order of Connect middleware, Mounting Connect middleware.

UNIT II

Building an Express Web Application: Introduction Express, Installing Express, Creating your first Express application, The application, request and response objects, External middleware, **Implementing the MVC pattern:** The application folder structure, vertical folder structure, File-naming conventions, Implementing the horizontal folder structure, Handling request routing, Adding the routing file, Configuring an Express application, Rendering views, serving static files, Configuring sessions.

UNIT III

Introduction to MongoDB: Introducing MongoDB, Key Features of MongoDB, MongoDB shell, MongoDB databases, CRUD Operations.

Introduction to Mongoose: Introducing Mongoose, Understanding Mongoose schemas, Creating the user schema and model, Registering the User model, Creating new users using save(), Finding multiple user documents using find(), Reading a single user document using findOne(), Updating an existing user document, Deleting and existing user document.

UNIT IV

Introduction to Angular: Introducing Angular 2, Angular 2 Architecture, Angular 2 Modules, Angular 2 Components, Angular 2 Templates.

Angular 2 data binding: Interpolation binding, Property binding, Event binding, Angular 2 Directives, Angular 2 Dependency Injection, Angular 2 Routing.

TEXT BOOKS

[1] Amos Q. Haviv , **"MEAN Web Development"**, Second Edition, Packt Publishing, December 2016.

Web Reference:

https://www.w3schools.com/ (UNIT-IV Chapter: 2&3)

REFERENCE BOOKS

[1] Brad Dayley, Brendan Dayley, Caleb Dayley, "Node.js, MongoDB and Angular Web Development," Pearson, 2nd Edition,2018.
[2] Simon Holmes , "Getting MEAN with Mongo, Express, Angular, and Node", Second Edition, Manning Publications, First Edition (31 October 2015).
[3] Jeff Dickey, "Write Modern Web Apps with Mean Stack , Peachpit press, 2015
[4] Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel, Pearson
[5] Ethan Brown "Web Development with Node; Express (Leveraging the Java Script Stack), First Edition, OReilly Publications.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Courseera: Jogesh K. Muppala,Associate Professor, The Hong Kong University of Science and Technology Full-Stack Web Development ,The Hong Kong University of Science and Technology
https://www.coursera.org/specializations/full-stack-react#about
[2] Udemy : Brad Traversy, Full Stack Web Developer & Instructor at Traversy Media, MERN Stack Front To Back: Full Stack React, Redux & Node.js
https://www.udemy.com/course/mern-stack-front-to-back/

SEMESTER VI

20AI&DSH6801A
ARTIFICIAL INTELLIGENCE FOR ROBOTICS

Course Category:	HONOR	**Credits:**	4
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3-1-0
Prerequisites:	20AI&DS4302 Design and Analysis of Algorithms	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand the concepts of Artificial Intelligence used in robotics	K2	1.7.1,2.5.1,2.5.2
CO2	Apply different searching strategies for a given application	K3	1.7.1,2.5.1,2.5.2, 2.6.3,2.7.1,3.5.1
CO3	Apply LISP and Prolog programming for a given application	K3	1.7.1,2.5.1,2.5.2, 2.6.3,2.6.4,3.5.1
CO4	Understand the basic concepts of Expert Systems	K2	2.5.1,2.5.2,2.6.3, 2.6.4, 3.5.1.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2												
CO2	2	2	3										2	2
CO3	2	2	2										2	2
CO4		2	3										2	2

Course Content

UNIT I:

Introduction – History, Definition of AI, Emulation of human cognitive process, Intelligent agents – The concept of rationality, the nature of environments, the structure of agents.

UNIT II:

Problem – Solving Agents: Problem Definitions, Formulating Problems, searching for solutions – Measuring Problem – Solving Performance with examples. Search Strategies: Uninformed search strategies – Breadth – first Search, Uniform – Cost Search, depth –first search, depth – limited search, Iterative deepening depth – first search, bidirectional search, comparing uniformed search strategies. Informed search strategies – Heuristic information, Hill climbing methods, best – first search, branch and – bound search, optimal search and A* and Iterative deepening A*.

UNIT – III

LISP and other programming languages – Introduction to LISP, Syntax and numerical function, LISP and PROLOG distinction, input, output and local variables, interaction and recursion, property list and arrays alternative languages, formalized symbolic logics – properties of WERS, non-deductive inference methods.

UNIT – IV

Expert system – Introduction, difference between expert system and conventional programs, basic activities of expert system – Interpretation,Prediction, Diagnosis, Design, Planning, Monitoring, Debugging, Repair, Instruction, Control. Basic aspects of expert system – Acquisition module, Knowledge base – Production rules, semantic net, frames. Inference engine – Backward chaining and forward chaining. Explanatory interface.

TEXT BOOKS

[1] Russell Stuart, Norvig Peter, *"Artificial Intelligence Modern Approach"*, Pearson Education series in AI, 3rd Edition, 2010.

REFERENCE BOOKS

[1] Dan.W.Patterson, "*Introduction to Artificial Intelligence and Expert Systems*", PHI Learning, 2009.

[2].Donald.A.Waterman, "*A guide to Expert Systems*", Pearson, 2002.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1]. https://www.udacity.com/course/artificial-intelligence-for-robotics--cs373

[2]. https://omscs.gatech.edu/cs-7638-artificial-intelligence-robotics

20AI&DSH6801B
BACKENDTECHNOLOGIES

Course Category:	Honors	**Credits:**	4
Stream/ Course Type:	Full Stack and Web Development/ Theory	**Lecture -Tutorial-Practice:**	3-1-0
Prerequisites:	20AI&DS3304 Java Programming	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand Django framework, MVT architecture	K2	1.7.1,2.5.1,2.5.2
CO2	Apply Django framework to develop dynamic web application connecting database	K3	1.7.1,2.5.1,2.5.2,2.6.3, 2.7.1,3.5.1,
CO3	Apply Django to Create a web application.	K3	1.7.1,2.5.1, 2.5.2,2.6.3, 2.6.4 3.5.1,
CO4	Apply PHP to create an interactive web application	K3	1.7.1,2.5.1, 2.5.2,2.6.3,2.6.4, 3.5.1,4.6.2,5.4.2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**	**2**												
CO2	**2**	**2**	**3**										**2**	**2**
CO3	**2**	**2**	**2**										**2**	**2**
CO4	**2**	**2**	**3**	**2**	**2**								**2**	**2**

COURSE CONTENT

UNIT 1

What is Django: Introduction, Django overview, What is a framework, why do we need a framework, What are some famous web frameworks?, What is a virtual environment?, How to create and use a virtual environment?, How to install Django?, How to create a Django Project?, Overview of your Django project files

Overview of MVT Architecture: What is architecture?, What is MVT?, What are models in Django's MVT?, What are views in Django MVT?, What are Templates in Django's MVT?

The Django Admin Utility: Introduction, Admin page of your Django project, Creating an app, Editing models.py, settings.py, and admin.py, Adding data to your database, Editing data in your database.

UNIT II

Interacting with the Database using Query Sets: Introduction, ORM overview, Query sets, Adding elements to your database, Manipulating elements of your database, Deleting elements of your database,

Understanding Models: Introduction to models, Model fields, Meta options, Model methods, Relationship between models, Connecting models

Django Views and Templates: Introduction, Types of views, Built-in class-based views, Introduction to templates, configuration, template inheritance, Django templating language.

UNIT III

URLs and Regex: Introduction, Functions available in URLconfs, Regex, Writing a regex for different url-functions

Forms in Django: Introduction, building basic forms, fetching data entered in the forms, Form fields and arguments, Form validation and model forms.

UNIT IV

PHP : Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form

processing, Files,

Advance Features: Cookies and Sessions, Object Oriented Programming with PHP

PHP and MySQL : Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and database bugs

TEXT BOOKS

[1] Awanish Ranjan,"Building Websites with Django", First Edition, BPB Publications, India, 2021.
[2] Robin Nixon, "Learning PHP, MySQL, JavaScript, and CSS", 2nd Edition, O'Reilly Media, Inc. 2012

REFERENCE BOOKS

[1] Allen B. Downey, "Think Python: How to Think Like a Computer Scientist.", O'Rielly Media, Inc.
[2] William S Vincent,"Django for Beginners: Build websites with Python and Django", Independently Published, 2018.
[3] Jeff Forcier ; Paul Bissex; Wesley Chun, "Python Web Development with Django", First Edition, Pearson Education; 2009.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Courseera: Prof. Charles Russell Severance, University of Michigan , Django for Everybody Specialization ,The
https://www.coursera.org/specializations/django#instructors
[2] Udemy : Volkan Atış, Python Software Developer and Teacher, Django 3.0 MasterClass - Learn How To Create Django Apps
https://www.udemy.com/course/django-30-masterclass-learn-how-to-create-django-apps/#instructor-1

SEMESTER VII

20AI&DSH7801B
FRAMEWORK AND MICROSERVICES

Course Category:	HONOR	**Credits:**	4
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3-1-0
Prerequisites:	20AI&DS4303: Advanced Java Programming 20ES2103C: Programming Essentials in Python 20AI&DSH4801B: Frontend Technologies 20AI&DSH6801B: Backend Technologies	**ContinuousEvaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	*Understand* the Microsoft .NET Framework Architecture and Fundamentals of C#.	K2	1.7.1,2.5.1, 2.5.2,3.5.1
CO2	*Apply* an OOP principles and ASP.NET to create dynamic web applications.	K3	1.7.1,2.5.1,2.5.2, 2.6.3,2.7.1,3.5.1,
CO3	*Apply* ASP.NET Core Razor pages to create a web application.	K3	1.7.1,2.5.1, 2.5.2,2.6.3,2.6.4 3.5.1,
CO4	*Apply* .NET Core to create microservices.	K3	1.7.1,2.5.1, 2.5.2,2.6.3,2.6.4, 3.5.1,

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	3											
CO2	2	2	3										2	2
CO3	2	2	2										2	2
CO4		2	3										2	2

Course Content

UNIT I

Understanding .NET 6 Framework and Introducing C#: Introduction, .NET Framework Architecture, Components of Framework, CTS, The Common Language Runtime, The Common Language Specification, The Common Type System, Object orientation, Type Safety, Memory management, Platform support, A brief history of C#.

C# Language Basics: A First C# Program, Syntax, Type basics, Numeric Types, Boolean type and operators, Strings and Characters, Arrays, Variables and Parameters, Expressions and Operators, Null operators, Statements, Namespaces.

UNIT II

Creating Types in C#: Classes, Inheritance, The object type, Structs, Access modifiers, Interfaces, Enums, Nested types, Generics.

Introduction to ASP.NET: ASP.NET Basics, ASP.NET Page Structure, Page Life Cycle.Controls: HTML Server Controls, Web Server Controls, Web User Controls, Validation Controls, Custom Web Controls.

UNIT III

Building Websites using ASP.NET Core: New features in ASP.NET Core, Understanding web development, Understanding HTTP, Using Google Chrome to make HTTP requests,

Understanding ASP.NET Core: Classic ASP.NET versus modern ASP.NET Core, Creating an empty ASP.NET Core project, Testing and securing the website, Controlling the hosting environment, Separating configuration for services and pipeline, Enabling a website to serve static content

UNIT IV

Working with Data Using Entity Framework Core: Understanding modern databases, Understanding Entity Framework Core,Creating a console app for working with EF Core, Using a sample relational database, Using Microsoft SQL Server for Windows, Setting up EF Core, Defining EF Core Models, Quering EF Core models, Loading patterns with EF Core, Manipulating data

with EF Core, Using Entity Framework Core with ASP.NET Core

Designing a Web API: Difficulty with Traditional services, Building a Web API services with ASP.NET Core, Designing a RESTful Interface, REST at a glance, REST in ASP.NET Core.

TEXT BOOKS

[1] Joseph Albahari,"C#10 in a Nut Shell", Oreilly Publications. Nov 2021.
[2] Mark J.Price, " C# 10 and .NET 6 – Modern Cross-Platform Development - Sixth Edition", Oreilly Publications. Nov 2021.
[3] Dino Esposito, "Programming ASP.NET Core", Microsoft, PHI Publications, 2019

REFERENCE BOOKS

[1] Kemal Birer," ASP.NET Core for Jobseekers"bpb publications 2021.
[2] Andreas Helland, "ASP.NET Core 5 for Beginners", Packt, 2021.
[3] Kogent Learning Solutions, "ASP.NET4.5 PROGRAMMING", Black Book, Dreamtech Press, 2016.
[4] Adam Freeman, "Pro ASP.NET MVC 5", Fifth Edition, APress, 2020

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Scott Hanselman, Maira Wenzel, Modern Web Development with .NET 6 Ep1: Create a web UI with ASP.NET Core https://docs.microsoft.com/en-us/shows/learn-live/modern-web-development-net6-ep01-create-web-ui-aspnet-core

[2] Rehan Saeed, Upgrading ASP.NET Core to .NET 6 & C# 10,

https://techcommunity.microsoft.com/t5/web-development/upgrading-asp-net-core-to-net-6-amp-c-10/m-p/2927530 and https://www.youtube.com/watch?v=T6iP7QPWmPI (Microsoft) (16-05-2022)

[3] Cam Sopar, Getting Started with Entity Framework Core,

https://docs.microsoft.com/en-us/shows/entity-framework-core-101/getting-started-with-entity-framework-core

[4] Kaushik Roy Chowdhury, ASP.NET 6.0 - Build Hands-On Web Projects, https://www.udemy.com/course/aspnetcore-31-build-hands-on-web-projects/

20AI&DSH7801A AI in security applications

Course Category:	HONOR	**Credits:**	4
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3-1-0
Prerequisites:		**ContinuousEvaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	To know the different AI techniques and their applications to computer security.		
CO2	To analyze the applicability of AI strategies for different security problems.		
CO3	To use intelligent algorithms for improving software security.		
CO4	To apply AI tools for automatic intrusion detection		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1														
CO2														
CO3														
CO4														

Course Content

UNIT I

Introduction: Role of AI in Cyber Security and Security Framework: Artificial Intelligence in Cyber Security, Challenges and Promises, Security Threats of Artificial Intelligence

Use-Cases: Artificial Intelligence Email Observing, Programming in Python and Basics of manipulation of Data.

UNIT II

Machine Learning in Security: Introduction to Machine Learning, Applications of Machine Learning in Cyber Security Domain, Machine Learning: tasks and Approaches, Anomaly Detection, Privacy Preserving Nearest Neighbour Search, Machine Learning Applied to Intrusion Detection, Online Learning Methods for Detecting Malicious Executables

UNIT III

Deep Learning in Security: Introduction to deep learning, Cyber Security Mechanisms Using Deep Learning Algorithms, Applying deep learning in various use cases, Network Cyber threat Detection

UNIT IV

Artificial Intelligence in Cyber Security: Model Stealing & Watermarking, Network Traffic Analysis, Malware Analysis

TEXT BOOKS

Tsai, Jeffrey JP, and S. Yu Philip, eds. Machine learning in cyber trust: security, privacy, and reliability. Springer Science & Business Media, 2009.

REFERENCE BOOKS

[1] Gupta, Brij B., and Quan Z. Sheng, eds. Machine learning for computer and cyber security: principle, algorithms, and practices. CRC Press, 2019

[2] Artificial Intelligence and Data Mining Approaches in Security Frameworks

Editor(s):Neeraj Bhargava, Ritu Bhargava, Pramod Singh Rathore, Rashmi Agrawal, 2021.

E-RESOURCES AND OTHER DIGITAL MATERIAL

VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE
(AUTONOMOUS)
Kanuru, Vijayawada-520007, AP, India

B.Tech Degree with Honors

DEPARTMENT OF CIVIL ENGINEERING

LIST OF COURSES OFFERED UNDER HONORS

S. No.	Course Code	COURSE NAME	L	T	P	Credits
FOURTH SEMESTER						
1	20CEH4801A	StabilityofStructures	3	1	0	4
2	20CEH4804B	Sustainable Construction Methods	3	1	0	4
3	20CEH4801C	Design of Formwork	3	1	0	4
FIFTH SEMESTER						
4	20CEH5802A	EngineeringRockMechanics	3	1	0	4
5	20CEH5801B	Advanced SteelDesign	3	1	0	4
6	20CEH5804C	GeospatialDataProcessing	3	1	0	4
SIXTH SEMESTER						
7	20CEH6803A	Traffic Analysis and Design	3	1	0	4
8	20CEH6803B	TransportationEconomics	3	1	0	4
9	20CEH6802C	AdvancedFoundationEngineering	3	1	0	4

SEVENTH SEMESTER						
10	20CEH7802A	Geo Synthetics and Reinforced Soil Structures	3	1	0	4
11	20CEH7803B	IntelligentTransportationSystems	3	1	0	4
12	20CEH7804C	EnvironmentalImpactAssessment	3	1	0	4

S. No.	Course Code	COURSE NAME	L	T	P	Credits
1	20CEM5811	SELF LEARNING				2
2	20CEM7812	SELF LEARNING				2

HONOR DEGREE IN COMPUTER SCIENCE & ENGINEERING

Semester 4 (2-2)

S.No	Course Code	Stream	*Course Name*	L	T	P	Credits
1	20CSH4801A	Artificial Intelligence and Machine Learning	Advanced Python Programming	3	1	0	4
2	20CSH4801A	Data Science	Advanced Python Programming	3	1	0	4
3	20CSH4801B	Internet of Things and Cloud	Fundamentals of IoT & Cloud	3	1	0	4
4	20CSH4801C	Cyber Security and Blockchain	Information Security	3	1	0	4
5	20CSH4801D	Augmented Reality and Virtual Reality	Game Design & Asset Creation	3	1	0	4
6	20CSH4801E	Full Stack Development	Frontend Technologies	3	1	0	4

ELECTRONICS & COMMUNICATION ENGINEERING
List of Courses offered under HONORS in VR20

Course Code	Course Name	L	T	P	Credits
Module – I (Semester IV)					
20ECH4801A	Design and Applications of Analog CMOS Integrated Circuits	4	0	0	4
20ECH4801B	Elements of Data Communications	4	0	0	4
20ECH4801C	Linear Algebra	3	1	0	4
20ECH4801D	Electromagnetic Interference and Compatibility	4	0	0	4
20ECH4801E	Programming languages for embedded software	3	1	0	4
Module – II (Semester V)					
20ECH5802A	Sensors and Actuators	4	0	0	4
20ECH5802B	Advanced Computer Networks	4	0	0	4
20ECH5802C	Discrete spectral analysis	3	1	0	4
20ECH5802D	Computational Electromagnetics	3	1	0	4
20ECH5802E	Testing and Testability	4	0	0	4
Module – III (Semester VI)					
20ECH6803A	Micro Chip Fabrication Technology	4	0	0	4
20ECH6803B	Modern Data Networks	4	0	0	4
20ECH6803C	Multirate signal processing and wavelets	3	1	0	4
20ECH6803D	RF System Design And Measurements	4	0	0	4
20ECH6803E	Communication Busses and Interfaces	4	0	0	4
Module – IV (Semester VII)					
20ECH7804A	Biomedical Electronics	4	0	0	4
20ECH7804B	MIMO OFDM Communication Systems	4	0	0	4
20ECH7804C	Medical imaging and processing	4	0	0	4
20ECH7804D	Planar Antennas For Wireless Applications	4	0	0	4
20ECH7804E	Device Drivers	4	0	0	4
20ECH5811	Self Learning Course/MOOCS Course1				2
20ECH7812	Self Learning Course/MOOCS Course 2				2
	Total				20

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

HONORS IN ELECTRICAL & ELECTRONICS ENGINEERING

S.No	Course Code	Title of the Course	L	T	P	Credits
Fourth Semester						
1.	20EEH4801A	Utilization of Electrical Energy	4	0	0	4
2.	20EEH4801B	Digital Signal Processing	4	0	0	4
3.	20EEH4801C	Renewable Energy Systems	4	0	0	4
4.	20EEH4801D	Electrical Materials	4	0	0	4
Fifth Semester						
5.	20EEH5802A	Renewable Energy Systems	4	0	0	4
6.	20EEH5802B	Energy Conservation & Audit	4	0	0	4
7.	20EEH5802C	Industrial Applications in Electrical Engineering	4	0	0	4
8.	20EEH5802D	Energy Storage Systems	4	0	0	4
9.	20 EEH5811	Self Learning Course	0	0	0	2
Sixth Semester						
10.	20 EEH6803A	Special Electrical Machines	4	0	0	4
11.	20 EEH6803B	Utilization of electrical energy	4	0	0	4
12.	20 EEM6803C	Introduction to Smart Grid	4	0	0	4
13.	20 EEM6803D	Electrical Drives	4	0	0	4
Seventh Semester						
14.	20 EEH7804A	Power Quality	4	0	0	4
15.	20 EEH7804B	Linear Control Systems	4	0	0	4
16.	20 EEH7804C	PLC	4	0	0	4
17.	20 EEH7804D	Electric Vehicles	4	0	0	4
18.	20 EEH7812	Self Learning Course	0	0	0	2

V.R.SIDDHARTHA ENGINEERING COLLEGE (Autonomous)

Department of Electronics & Instrumentation Engineering

Honors in Electronics and Instrumentation Engineering

S.No	Course Code	Name of the Course	L	T	P	Credits
Semester IV						
1.	20EIH4801A	Computational Methods for Linear Control Systems	4	0	0	4
2.	20EIH4801B	Fiber Optic Sensors	4	0	0	4
3.	20EIH4801C	Computational Methods for Signal Processing	4	0	0	4
4.	20EIH4801D	Real Time Operating Systems	4	0	0	4
Semester V						
1.	20EIH5802A	Optimization Techniques	4	0	0	4
2.	20EIH5802B	Micro Electro Mechanical Systems	4	0	0	4
3.	20EIH5802C	Advanced Digital Signal Processing	4	0	0	4
4.	20EIH5802D	Reconfigurable Architectures	4	0	0	4
Semester VI						
1.	20EIH6803A	Modern Control Systems	4	0	0	4
2.	20EIH6803B	Principles and Applications of nanotechnology	4	0	0	4
3.	20EIH6803C	Computer Vision	4	0	0	4
4.	20EIH6803D	System on chip	4	0	0	4
Semester VII						
1.	20EIH7804A	Digital Control System Design	4	0	0	4
2.	20EIH7804B	Multi Sensor Data Fusion	4	0	0	4
3.	20EIH7804C	Deep Learning for Computer Vision	4	0	0	4
4.	20EIH7804D	Embedded Control Systems	4	0	0	4
	20EIM5811	SELF LEARNING				2
	20EIM7812	SELF LEARNING				2

Two MOOCS/NPTEL Courses for 04 credits (02 courses @ 2 credits each) are mandatory

VELAGAPUDI RAMAKRISHNA SIDDHARTHA ENGINEERING COLLEGE

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSES OFFERED UNDER HONOR DEGREE IN AI & DATA SCIENCE

S.No	Course code	Course Name	Offered in Semester	L	T	P	Credits
1	20ITH4801	AI Foundations for Business	**IV**	4	0	0	4
2	20ITH5802	Reinforcement Learning	**V**	4	0	0	4
3	20ITH6803	End-to-end Machine Learning with Tensor Flow on GCP	**VI**	4	0	0	4
4	20ITH7804	Deep Learning for Health Care	**VII**	4	0	0	4
(MOOCs - Self Learning)							
5	20ITH5811	Advanced Data Science	**V**	-	-	-	2
6	20ITH7812	Machine Learning Engineering for Production	**VII**	-	-	-	2

VELAGAPUDI RAMAKRISHNA SIDDHARTHA ENGINEERING COLLEGE

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSES OFFERED UNDER HONOR DEGREE IN CYBER SECURITY

S.No	Course Code	Title of the course	Offered in Semester	L	T	P	Credits
1	20ITH4801A	Data Privacy	IV	4	0	0	4
	20ITH4801B	Cryptanalysis	IV	4	0	0	4
2	20ITH5802A	IoT and Security	V	4	0	0	4
	20ITH5802B	Big Data Security	V	4	0	0	4
3	20ITH6803A	Cyber Physical Systems	VI	4	0	0	4
	20ITH6803B	Cloud Security	VI	4	0	0	4
4	20ITH7804A	Blockchain security and performance	VII	4	0	0	4
	20ITH7804B	Data Analytics for Fraud Detection	VII	4	0	0	4
MOOCs - SELF LEARNING COURSES							
1	20ITH5811	Information Security and Cyber Forensics	V	-	-	-	2
2	20ITH7812	Online privacy	VII	-	-	-	2

DEPARTMENT OF MECHANICAL ENGINEERING

HONORS IN MECHANICAL ENGINEERING

S.No	Course Code	Title of the Course	L	T	P	Credits
Fourth Semester						
1.	20 MEH4801A	Introduction to Composite Materials	4	0	0	4
2.	20 MEH4801B	Energy Systems and Management	4	0	0	4
3.	20 MEH4801C	Production and operations management	4	0	0	4
Fifth Semester						
4.	20 MEH5802A	Robotics & Automation	4	0	0	4
5.	20 MEH5802B	Alternate Fuels	2	0	4	4
6.	20 MEH5802C	Precision Engineering	4	0	0	4
	20MEM5811	SELF LEARNING				2
Sixth Semester						
7.	20 MEH6803A	Vibration and Noise Engineering	3	1	0	4
8.	20 MEH6803B	Solar Energy Systems	4	0	0	4
9.	20 MEH6803C	Advanced Manufacturing Processes	4	0	0	4
Seventh Semester						
10.	20 MEH7804A	Fault Diagnostics & Condition monitoring	4	0	0	4
11.	20 MEM7804B	Experimental Methods in Thermal Engineering	4	0	0	4
12.	20 MEM7804C	Automation in Manufacturing	4	0	0	4
	20MEM7812	SELF LEARNING				2