KANNUR UNIVERSITY

(Abstract)

Integrated M.Sc. in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme under CBCSS, offered at NAS College Kanhangad- Syllabus of 6th Semester Core Courses with Model Question Papers- Implemented w.e.f 2020 admission onwards- Orders issued.

ACADEMIC C SECTION

Acad/C2/16586/NGCI/2021 Dated: 24.05.2023

Read:-1. U.O Acad/C2/16586/NGCI/2021(I) dated 30.07.2021
2. U.O Acad/C2/16586/NGCI/2021(1) dated 11.08.2021
3. U.O Acad/C2/16586/NGCI/2021 dated 17.03.2022
4. U.O Acad/C2/16586/NGCI/2021 dated 19.10.2022
5. Syllabus of 6th Semester Core Course & Model Question Papers submitted by the Expert Committee Convenor, vide e-mail dtd. 18.04.2023

ORDER

1. As per paper read (1), (2), (3) & (4) above, the Scheme, Syllabus of 1st, 2nd, 3rd, 4th & 5th Semester Core Course and Model Question Papers of the New Generation programme viz, integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning (CBCSS) , offered at Nehru Arts & Science College Kanhangad, was implemented w.e.f 2020 admission.
2. As per paper read (5) above, the Convenor, Expert Committee submitted the syllabus of 6th Semester Core Course & Model Question Papers of Integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme prepared by the Expert Committee.
3. The Vice-Chancellor, after considering matter in detail and in exercise of the power of the Academic Council conferred under section 11(1) Chapter III of the Kannur University Act 1996, accorded sanction to implement the syllabus of 6th Semester Core Course & Model Question Paper of Integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme (CBCSS) , offered at Nehru Arts & Science College Kanhangad, w.e.f 2020 admission, and to report the same to the Academic Council.
4. The Syllabus of 6th Semester Core Course & Model Question Papers for Integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme (CBCSS), w.e.f 2020 admission, are appended and uploaded in the university website (www.kannuruniversity.ac.in).

5 .Orders are issued accordingly.

Sd/-
Narayanadas K
DEPUTY REGISTRAR (ACAD)
For REGISTRAR

To: The Principal
Nehru Arts & Science College, Kanhangad

Copy To: 1.The Examination Branch (PA to CE)
2. PS to VC/PA to PVC/PA to Registrar
3. DR/AR I Academic, EXCI
4.The Web Manager (for uploading on website)
5. SF/DF/FC

KANNUR UNIVERSITY * THAVAKKARA * CIVIL STATION P.O. KANNUR Pin-670 002

Forwarded / By Order

SECTION OFFICER

6B20ICSC: Web Technology

Semester	Course Code	Hours per Week	Exam Hours	Credits
6	6B20ICSC	4	3	3

Course Outcome

CO 1: Develop skills to design a web page using HTML and CSS
CO 2: Familiarise python skills required to develop web application using django Framework
CO 3: Understand basics of Django framework
CO 4: Understand steps in creating web applications using Django
CO 5: Familiarise client side scripting using JavaScript

Unit I

Introduction to WWW and HTML, Structure of HTML, HTML elements and attributes, Headings, Paragraphs, Formatting tags, line breaks, Comments, Links, Images, Lists, HTML5 Semantic Elements (header, footer, nav, section, article, nav, aside), HTML Tables.

(10 Hours)

Unit II

HTML Forms (input, select, textarea, button, datalist), Input types (text, password, submit, radio, checkbox, date, email), Input attributes (value, readonly, disabled, maxlength, autocomplete, list, min, max, placeholder), HTML5 form validation (required and pattern attribute of input type), Applying style to html using CSS (Inline, Internal and External CSS, Colors, Fonts, Borders, Padding, Applying style using class and id attribute), Positioning Elements: Absolute Positioning, Relative Positioning, Basics of Responsive CSS, Media port & Media Queries

(16 Hours)

Unit III

Python basics - variables, control statements, lists, tuples, dictionaries, sets, functions, modules, basics of object oriented programming in python, decorators, lambda functions, exceptions. Introduction to web applications, django framework, routes, templates, conditionals, django forms, sessions, Basics of Django Models, Migrations, Django Admin, User Management.

(16 Hours)

Unit IV

Introduction, JavaScript Fundamentals - variables, operators, data types, strings, arrays, functions, objects, control statements, events, querySelector, DOM Manipulation - JavaScript Console, Arrow Functions, Intervals, Local Storage, overview of JSON - JSON Data Interchange Format: Syntax, Data Types, Object, JSON Schema, using APIs in Javascript, User interfaces, Window Object, Animation in Javascript, overview of react, Testing - Assert, unit Testing, Django testing- Client Testing.

(12 Hours)

References

[1] Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, *Internet & World Wide Web How to Program* 5/e, Pearson, 2018.

[2] Julie C. Meloni, *PHP, MySQL & JavaScript All in One, Sams Teach Yourself*, 6/e, Sams, 2017.

[3] https://docs.djangoproject.com/en/4.2/

[4] https://cs50.harvard.edu/web/2020/

[5] David Flanagan, *Javascript, The Definitive Guide*, 7/e, O'Reilly, 2020.

[6] Lindsay Bassett, *Introduction to JavaScript Object Notation: A To-the-Point Guide to JSON*, O'Reilly, 2015.

Marks Including Choice

Unit	Marks
I	16
II	16
III	14
IV	14

6B21ICSC: Introduction to Deep Learning

Semester	Course Code	Hours per Week	Exam Hours	Credits
6	6B21ICSC	4	3	3

Course Outcome

CO 1: To understand the fundamental concepts of deep learning and its basic building blocks.
CO 2: To be able to describe the basic architecture of artificial neural networks, including perceptrons and multilayer perceptrons.
CO 3: To explore the concepts of fairness, accountability, and transparency in machine learning, and how they apply to deep learning applications.
CO 4: To examine various activation functions used in deep learning and how they impact deep network performance.
CO 5: To analyze the challenges of deep network optimization, including overfitting, underfitting, hyperparameters, and validation sets, and explore different optimization algorithms.
CO 6: To investigate regularization techniques for deep learning.

Unit I

What is Deep Learning?,Deep Learning Vs Machine Learning ,What are Neural Networks?, The Basic Architecture of Artificial Neural Network ,Perceptrons, Multilayer perceptrons,The basic building blocks of deep learning, Fairness, Accountability, and Transparency in Machine Learning, Applications of Deep Learning

(13 Hours)

Unit II

Activation Functions-ReLU Function, Sigmoid Function, Tanh Function, Leaky ReLU, Swish, Softmax, Capacity, overfitting and underfitting, hyper parameters and validation sets, Estimators, Bias and Variance, Deep Networks: Feed forward networks – Learning XOR- Gradient based Learning – Hidden units – Architecture design- Back propagation – Differentiation algorithms

(13 Hours)

Unit III

Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier

(15 Hours)

Unit IV

Optimization for Train Deep Models: How learning differs from pure optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with

Adaptive Learning Rates, Approximate SecondOrder Methods, Optimization Strategies and Meta-Algorithms

(13 Hours)

Text Books

[1] Ian Goodfellow and Yoshua Bengio and Aaron Courville, *Deep Learning*, MIT Press (2016)

[2] Simon Haykin, *Neural Networks and Learning Machines*, 3/E, Pearson Prentice Hall (2016)

[3] Aston Zhang, Zachary C. Lipton, Mu Li, Alexander J. Smola, *Dive into Deep Learning*, Cambridge University Press

References

[1] Charu C. Aggarwal, *Neural Networks and Deep Learning*, Springer (2018)

[2] Francois Chollet, *Deep Learning with Pytho*n, 2/e, Manning (2021)

[3] Laurene Fausett, *Fundamentals of Neural Networks: Architectures, Algorithms and Applications*, Pearson (2004)

[4] Jan Brinkhuis, *Optimization : Insights And Applications*, New Age (2010)

[5] Jon Krohn, Grant Beyleveld, Aglaé Bassens, Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence, Pearson (2020)

Marks Including Choice

Unit	Marks
I	14
II	16
III	16
IV	14

6B22ICSC: Computer Networks

Semester	Course Code	Hours per Week	Exam Hours	Credits
6	6B22ICSC	3	3	3

Course Outcome

CO 1: Understand the basic elements that work together to form the internet
CO 2: Understand the concept of layered network architecture
CO 3: Understand the protocols and services offered by application, transport, network and link layers
CO 4: Understand the basic physical layer protocols

Unit I

Introduction to internet - protocol, access networks, physical media, packet switching, circuit switching, delay, loss and throughput in packet switched networks, Layered architecture, OSI Model.
Application Layer - Network applications, Processes Communication - ports, sockets, web, HTTP, FTP, electronic mail protocols - SMTP, POP3, DNS.
Familiarization of wireshark, Simple HTTP Client using python**

(16 Hours)

Unit II

Transport Layer - Services, Multiplexing and demultiplexing, UDP - segment structure, checksum, Reliable data transfer - Go-Back-N, Selective Repeat. TCP - segment structure, Flow control, connection management, congestion control - causes, approaches to congestion control, TCP congestion control.
Wireshark Lab: TCP and UDP*

(12 Hours)

Unit III

Network layer- Forwarding and routing, network service models, routers, Internet Protocol (IP) - Datagram Format, IPv4 Addressing - DHCP, NAT, ICMP, IPv6. Routing Algorithms - Link-State routing algorithm, Distance-Vector routing algorithm, Routing in the Internet - Intradomain OSPF and Interdomain BGP.

(14 Hours)

Unit IV

Link Layer - Services, Error detection and correction techniques - parity checks, checksum methods and CRC, Multiple Access links and protocols - channel partitioning protocols (TDM, FDM and CDMA), random access protocols (Slotted ALOHA, Aloha, CSMA,CSMA/CD). Link layer addressing and ARP, Ethernet, Wireless Links - CDMA, WiFi - 802.11 architecture.

(12 Hours)

**Only for CE (Continuous Evaluation) and shall not be considered for ESE (End Semester Evaluation)*

Text Books

[1] Kurose, J. and Ross, K. (2017). *Computer Networking: A Top-down Approach*, 6th edition, Pearson Education.

References

[1] Tanenbaum, A.S. and Wetherall, D. (2011), *Computer Networks*, 5th edition, Pearson Education.
[2] Peterson, L. L., Davie, B. S. (2011). *Computer Networks: A Systems Approac*h, 5th edition, Morgan Kaufmann.
[3] Stallings, W. (2017). *Data and Computer Communicatio*n, 10th edition, Pearson Education.
[4] Stevens, W. R., Fall, K. R. (2011). *TCP/IP Illustrated, Volume 1: The Protocols*, 2nd edition, Pearson Education.

Marks Including Choice

Unit	Marks
I	16
II	14
III	16
IV	14

6B23ICSC: Design and Analysis of Algorithms

Semester	Course Code	Hours per Week	Exam Hours	Credits
6	6B23ICSC	3	3	3

Course Outcome

CO 1: Understand the asymptotic performance of algorithms.
CO 2: Understand various algorithm design techniques.
CO 3: Demonstrate familiarity with major algorithms and data structures.
CO 4: Understand the concepts of P, NP and NP-Complete class of problems.

Unit I

Introduction to Algorithms, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Fundamental Data Structures, Fundamentals of the Analysis of Algorithm Efficiency - The Analysis Framework, Asymptotic Notations and Basic Efficiency Classes.

(14 Hours)

Unit II

Mathematical Analysis of Nonrecursive Algorithms, Mathematical Analysis of Recursive Algorithms, Example: Computing the nth Fibonacci Number. Brute Force and Exhaustive Search - Selection Sort and Bubble Sort, Sequential Search and Brute-Force String Matching, Exhaustive Search.

(16 Hours)

Unit III

Divide-and-Conquer - Mergesort, Quicksort, Binary search, Binary Tree Traversals. Dynamic Programming - The Knapsack Problem and Memory Functions, Warshall's and Floyd's Algorithms. Greedy Technique - Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm.

(12 Hours)

Unit IV

P, NP, and NP-Complete Problems. Backtracking - n-Queens Problem, subset-sum problem. Approximation Algorithms for NP-Hard Problems (overview only).

(12 Hours)

Text Books

[1] Anany Levitin (2012). *Introduction to the Design and Analysis of Algorithms*, 3rd edition, Pearson.

References

[1] Thomas H. Cormen. Charles E. Leiserson. Ronald L. Rivest. Clifford Stein. I*ntroduction to Algorithms*, Third Edition. The MIT Press.
[2] Jon Kleinberg, Eva Tardos (2013), *Algorithm Design*, First Edition, Pearson Education India
[3] Jeff Erickson (2019), *Algorithms*, First Edition, (Online) https://jeffe.cs.illinois.edu/teaching/algorithms/book/Algorithms-JeffE.pdf

[4] Steven S. Skiena (2020), *The Algorithm Design Manual*, 3/E, Springer
[5] Alfred V. Aho, John E. Hopecroft, Jeffrey D. Ullman (2002), *Design and Analysis of Computer Algorithms*, Pearson
[6] Michael T. Goodrich, Roberto Tamassia (2006), *Algorithm Design: Foundations, Analysis and Internet Examples*, Wiley
[7] Robert Sedgewick, Philippe Flajolet, *An Introduction to Analysis of Algorithms*, Addison-Wesley Professional
[8] Tim Roughgarden (2017), *Algorithms Illuminated: Part 1: The Basics*

Marks Including Choice

Unit	Marks
I	14
II	16
III	16
IV	14

6B24ICSC: Lab-8: Web Technology

Semester	Course Code	Hours per Week	Exam Hours	Credits
6	6B24ICSC	3	3	3

Course Outcome

CO 1: Develop skills to design a web page using HTML and CSS
CO 2: Understand steps in creating web applications using Django
CO 3: Familiarise client side scripting using JavaScript

Exercises

1. Create a web pages using basic html formatting tags
2. Create a web page containing images and hyperlinks
3. Create a web page containing table
4. Create a web page containing all types of lists
5. Create a form with at least 5 form elements and appropriate validation.
6. Create a web pages using
    a. In-line CSS
    b. Internal CSS
    c. External CSS

    Note: use positioning css attributes
7. Create a web page using various CSS selectors
8. Create a web page using bootstrap css framework
9. Write a JavaScript code using functions to perform arithmetic operations on two numbers.
10. Write a JavaScript code to sort and reverse array elements.
11. Write a javascript code to create a TODO list.
12. Write a javascript program using queryselector.
13. Write a javascript program to implement animations.
14. Write a javascript program to implement an event handler.
15. Create a table with following schema books(title, author, shelfno). Create a django project which contains a form to accept book's title, author and shelf no. It should have features to insert title, author and shelf no in the form to the books table. Insert 3 books' details using this. Create a url to display all the book details.
16. Create a django project which uses sessions.

Students should be taught the usage of git. They should be encouraged to use online services like Gitlab/Github for uploading the programs written in the lab.

References

[1] Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, *Internet & World Wide Web How to Program* 5/e, Pearson, 2018.
[2] Julie C. Meloni, *PHP, MySQL & JavaScript All in One, Sams Teach Yourself*, 6/e, Sams, 2017.
[3] https://docs.djangoproject.com/en/4.2/
[4] https://cs50.harvard.edu/web/2020/

[5] David Flanagan, *Javascript, The Definitive Guide*, 7/e, O'Reilly, 2020.
[6] Lindsay Bassett, *Introduction to JavaScript Object Notation: A To-the-Point Guide to JSON*, O'Reilly, 2015.

6B25ICSC: Project

Semester	Course Code	Hours per Week	Exam Hours	Credits
6	6B25ICSC	8	-	7

*Refer regulations for the programme

Model Question Paper

6B20ICSC: Web Technology

Time: 3 Hours **Max. Marks: 40**

Part A: Short Answer

Answer All Questions **(6 x 1 = 6 Marks)**

1. What is a URL?
2. Differentiate between WWW and the Internet.
3. What is the use of placeholder attribute?
4. What is absolute positioning in CSS?
5. What is a module in python?
6. What is the use of sessions in django?

Part B: Short Essay

Answer Any 6 Questions **(6 x 2 = 12 Marks)**

7. Explain how images can be added in HTML with the help of an example.
8. What are different formatting tags in HTML?
9. Explain how hyperlinks are created in HTML
10. What are lambda functions
11. What are decorators in python?
12. Write a short note about JSON
13. What is the use of window object in Javascript?
14. How unit testing can be done in django?

Part C: Essay

Answer Any 4 Questions **(4 x 3 = 12 Marks)**

15. Explain about media port and media queries.
16. Explain in detail how radio input is different from checkbox.
17. Explain about different types of lists in HTML
18. Explain about different form validation techniques in HTML
19. Explain how classes are defined in python? Give an example.
20. How events are handled in Javascript? Give an example

Part D: Long Essay

Answer Any 2 Questions **(2 x 5 = 10 Marks)**

21. Explain about different semantic elements
22. Explain in detail about different ways with which CSS can be applied to HTML elements. How css styling is applied using class and id attributes?
23. What is the django framework used for? How are templates used to render HTML in django? Explain with the help of an example.
24. What are different control statements in Javascript?

Model Question Paper

6B21ICSC: Introduction to Deep Learning

Time: 3 Hours **Max. Marks: 40**

Part A: Short Answer

Answer All Questions **(6 x 1 = 6 Marks)**

1. What is Deep Learning?
2. What is a ReLU Function?
3. What is the purpose of dropout in deep learning?
4. What is the relationship between number of hidden layers and model capacity?
5. If you increase the number of hidden layers in a Multi Layer Perceptron, the classification error of test data always decreases. True or False? Justify your answer.
6. What is the advantage of batch Normalization?

Part B: Short Essay

Answer Any 6 Questions **(6 x 2 = 12 Marks)**

7. What Is a Multi-layer Perceptron(MLP)?
8. What Is the Role of Activation Functions in a Neural Network?
9. What Are Hyperparameters?
10. What will happen if the learning rate is set too low or too high?
11. What Is Dropout and Batch Normalization?
12. Explain Dataset Augmentation
13. Write an note on two Simple Strategies to Optimise/Tune the Hyperparameters:
14. Why might early stopping be considered a regularisation technique?

Part C: Essay

Answer Any 4 Questions **(4 x 3 = 12 Marks)**

15. Explain Fairness, Accountability, and Transparency in Machine Learning
16. What is a Hyperparameter in a Machine Learning Model?
17. What Is the Difference Between Batch Gradient Descent and Stochastic Gradient Descent?
18. What is Overfitting and Underfitting, and How to Combat Them?
19. Explain Challenges in Neural Network Optimization.
20. Explain the following variant of Gradient Descent: Stochastic, Batch, and Mini-batch?

Part D: Long Essay

Answer Any 2 Questions **(2 x 5 = 10 Marks)**

21. Explain different applications of Deep Learning.
22. Explain back propagation.
23. Explain Norm penalties.
24. How learning differs from pure optimization.

Model Question Paper

6B22ICSC: Computer Networks

Time: 3 Hours **Max. Marks: 40**

Part A: Short Answer

Answer All Questions **(6 x 1 = 6 Marks)**

1. What is meant by packet switching?
2. What is a port?
3. What is the primary function of the transport layer in the OSI model?
4. What is routing?
5. What is the purpose of BGP in internet routing?
6. What is ARP?

Part B: Short Essay

Answer Any 6 Questions **(6 x 2 = 12 Marks)**

7. Explain UDP segment structure
8. Explain about multiplexing and demultiplexing in Transport layer
9. What Is ICMP?
10. Differentiate between IPV4 and IPV6
11. Explain about slotted aloha
12. What is MAC address?
13. How parity checking is used for error detection?
14. What is ethernet?

Part C: Essay

Answer Any 4 Questions **(4 x 3 = 12 Marks)**

15. Differentiate between goBack N and selective repeat
16. Explain about DHCP.
17. Explain about different types of delay in packet switched network
18. Explain about FTP
19. Explain about SMTP and POP3.
20. With the help of a diagram explain the segment structure of TCP.

Part D: Long Essay

Answer Any 2 Questions **(2 x 5 = 10 Marks)**

21. Explain about different layers in OSI model
22. Explain about TCP congestion control
23. Explain about link state and distance vector routing algorithms
24. Explain in detail about CSMA and CSMA/CD.

Model Question Paper

6B23ICSC: Design and Analysis of Algorithms

Time: 3 Hours **Max. Marks: 40**

Part A: Short Answer

Answer All Questions **(6 x 1 = 6 Marks)**

1. Define NP Hard
2. Quicksort algorithm is better than selection sort for sorting a large set of numbers. Justify this statement
3. What is the worst case time complexity of sequential search
4. List any 2 linear data structures
5. What is the most appropriate data structure for answering telephone calls in the order of their known priorities
6. What is a brute-force algorithm?

Part B: Short Essay

Answer Any 6 Questions **(6 x 2 = 12 Marks)**

7. Briefly describe any 4 problem types.
8. Outline an exhaustive-search algorithm for the knapsack problem.
9. Discuss the pros and cons of the recursive Fibonacci series over its non recursive form
10. Explain binary search.
11. Explain Prim's algorithm
12. Explain warshall's algorithm
13. Defines subset sum problem and specify its complexity class.
14. Can every decision problem be solved in polynomial time? Justify your answer.

Part C: Essay

Answer Any 4 Questions **(4 x 3 = 12 Marks)**

15. Explain in detail about various asymptotic efficiency classes.
16. Differentiate best case, worst case, and average case.
17. Show that the worst time complexity of selection sort is O(n2)
18. Differentiate Sequential Search and Brute-Force String Matching
19. Explain Dijkstra's Algorithm
20. Define n-Queens Problem. How can it be solved?

Part D: Long Essay

Answer Any 2 Questions **(2 x 5 = 10 Marks)**

21. Explain in detail various asymptotic notations.
22. Explain in detail about exhaustive search.
23. Explain merge sort algorithm and analyse its time complexity.
24. Differentiate P, NP and NP Complete problems.