DSE-3: Computational Linguistics for Sanskrit

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Prerequisite of the course
		Lecture	Tutorial	Practical/ Practice		
Computational Linguistics for Sanskrit	04	3	1	0	Semester II Passed	Basic knowledge of Computer and Sanskrit

Learning Objectives

This course is supposed to familiarise the students with modern technology in the field of Computational linguistics and language technology and prepare the students for next level of Computational understanding in Sanskrit. After covering these topics in Computational Linguistics (CL), the students will learn the tools and techniques of CL and also do the detailed survey and learn various methodologies used in the field.

Learning outcomes

The course-level learning outcomes that a student of this course is required to demonstrate are indicated below:

- Learn the basics of Theoretical Concepts of Computational Linguistics.
- Learn the basic concepts of the various Applied Areas of Computational Linguistics e.g. Morphological Analyzer/Speech/Speaker Recognition, Speech Synthesis, Text to Speech, Language Analysis, Understanding, Generation, Natural Language Interface, Text Processing and Machine Translation etc.
- Learn the basic concept of databases for data Storage.
- Students will learn the Survey of Computational Linguistics.

Detailed Syllabus

Unit I **12Hrs**

Theoretical Concepts of Computational Linguistics:

Language and Communication, Levels of Language, Phonemes, Morphemes, POS, Lexicon, Syntax, Semantics, Discourse, Natural Language vs Artificial Language, Speech and Language, Grammars. Computer Intelligent Interaction (HCII), Human Processing of Languages vs Computer Processing of Natural Languages, Rule based vs Statistical Processing, Machine Learning, Annotation of Language, Standards, Unicode, and Language Resources.

Unit II **09Hrs**

Survey of the Sanskrit Computational Linguistics

Unit III **12Hrs**

Applied Areas of Sanskrit Computational Linguistics

Morphological Analyzer
Speech/Speaker Recognition
Speech Synthesis,
Text to Speech
Language Analysis
Language Understanding
Language Generation
Natural Language Interface
Text Processing
Machine Translation

Unit IV **12Hrs**

Data Storage:

An Introduction to Databases
Databases and Database Systems,
Architecture of Database Systems
Historical Perspective of Database Systems.
Basics of MS SQL Database

Essential/recommended readings

1. Chandra Subhash (2021). भाषासंगणन (Language Computing), Upasana Publications, New Delhi, India, ISBN: 978-93-87677-05-0.
2. Chandra Subhash (2017). मशीनी अनुवाद (Machine Translation) यूजीसी सीबीसीएस स्कीम के तहत बीए (संस्कृत) के एईईसी (AEEC)-3 के पाठ्यक्रम पर आधारित. Vidya Nidhi Prakashana, New Delhi, India, ISBN 978-93-85539-52-7.
3. Bharti A., R. Sangal, V. Chaitanya, “NL, Complexity Theory and Logic” in Foundations of Software Technology and Theoretical Computer Science, Springer, 1990.
4. Gazdar G. and C. Mellish, NLP in Prolog, Wokhingham: Addison Wesley, 1989.
5. Gazdar, G. and C. Mellish, NLP in Lisp, Wokhingham: Addison Wesley, 1989.

6. Grishman, R., Computational Linguistics: An introduction, Cambridge University Press, 1986.
7. Grosz, Barbara J. (et al.) Readings in NLP, (ed.) LA: Morgan Kaufmann, 1990
8. Kenneth A. Lambert, 2011, Fundamentals of Python: First Programs, Cengage Learning.
9. Nath Jha, Girish (ed.), 2010, Sanskrit Computational Linguistics, Springer. Verlag, Germany, 2010.
10. Ruslan Mitkov, Oxford handbook of computational linguistics, Oxford University Press, 2005.
11. Dan Jurafsky, James H. Martin, 2000, Speech and Natural Language Processing, Prentice Hall.
12. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems (5th Ed.), Pearson Education.

Suggested readings

1. Chandra, Subhash and Jha, GN. Computer Processing of Nominal Inflections in Sanskrit: Methods and Implementations, CSP, UK, 2012.
2. Sanskrit Computational Linguistics symposium 1-2: Springer Verlag LNCS 5402 G Huet, A Kulkarni and P Scharf (eds), Proceedings of the 1st and 2nd International Symposium, 2009.
3. Sanskrit Computational Linguistics symposium 3: Springer Verlag LNCS 5406 A Kulkarni, G Huet (eds), Proceedings of the 3rd International Symposium, Jan 15 - 17, 2009, Hyderabad.
4. Grishman, R., Computational Linguistics: An introduction, Cambridge University Press, 1986.

Examination scheme and mode: Subject to directions from the Examination Branch/University of Delhi from time to time