B.Tech Computer and Communication Engineering
19CCE284 Software Defined Radio Lab

Instructions to students

1. A hard bound unruled notebook to be used for the record purpose.
2. Aim, code, results and graphs to be handwritten / drawn neatly.
3. Only one side [right side] to be used for writing.
4. The experiment and output marks to be obtained from the faculty before the leaving the lab on the day of experiment. The record marks to be obtained in the same / next lab session.
5. Class notes can be used as reference for the lab sessions. However, discussion among the students is not allowed.
6. No repeat chance for any of the experiments. If a student is absent, he/she will be awarded zero marks. Absence due to medical reasons shall be considered towards the end of semester, subject to timely request initiated by the student with relevant documents.
7. Marks split up for continuous assessment

Experiment : 30
Output : 30
Record : 20

8. Topic for lab sessions are provided in this document. The students are expected to prepare for the lab. The exact question shall be given only during the lab slot.

Lab Session	Activity
1*	Familiarization with Python, simple experiments
2	Experiment 1
3	Experiment 2
4	Experiment 3
5	Experiment 4
6	Experiment 5
7	Experiment 6
8	Familiarization with GNU radio
9	Experiment 7
10	End Semester exam / Reserve
11	End Semester exam / Reserve
12	End Semester exam / Reserve

* These instructions to be briefed to the students on the first lab session and proceed with the familiarization part. All the familiarization experiments also to be written on record; however they are not evaluated [only endorsed by the faculty]

Note: Any changes in the above schedule, due to changes in academic calendar / notifications shall be informed as applicable.

Student batch split-up for lab sessions

Roll Nos.	Designation	Monday	Tuesday
001 – 037	Batch 1	19CCE283	19CCE284
038 - 073	Batch 2	19CCE284	19CCE283

Topics for experiments [Python based]

(Built-in functions are not allowed for experiments 1 -3)

Experiment 1: Sampling – low pass signal. Generating signal and sketching the spectrum for various sampling rates. Perform the analysis for both low pass and band limited signal of bandwidth B.

Experiment 2: Interpolation and decimation – time and frequency domain analysis. Generate signals of definite frequency and apply sampling rate conversion using decimation and interpolation. Study the time domain and frequency domain characteristics. [Experiment 1 to be used for spectral and time domain analysis]

Experiment 3: Fractional rate conversion. – Using the concept of interpolation and decimation, perform the fractional rate rate conversion for achieving the given sampling rate. [Experiment 2 to be used as basic blocks, experiment 1 to be used for spectral and time domain analysis]

Experiment 4: Polypohase structures. For the filters designed to be used in interpolators and decimators, implement the simplified polyphase architecture. Analyze the complexity and latency of the implemented filters. [Filter design can be done using any tool box – python or matlab]

Experiment 5: CIC filters. Design and implement a CIC filter to perform an arbitrary rate conversion from a given sampling frequency to the desired sampling frequency working on sinusoidal signals. [Filter design can be done using any tool box – python or matlab]

Experiment 6: Wavelets. For the given signal, perform wavelet decomposition and reconstruction using a Debauchies 4-tap wavelet system and verify the perfect reconstruction property of wavelets. [One level decomposition using filter bank concept]

Experiment 7: Baseband representation of linear and non-linear band pass signals and systems– time varying systems. Design and illustrate the baseband communication system using a simple program in GNU radio / GRC. [Pulse shaping/matched filter & carrier modulation not required]