ASSIGNMENT 1 - REPORT

1. **Code for the assignment on elective advisory system**

   (Here the system is made by asking students few questions upon their choice likings and CGPA or grades/M-Tech score etc and by keeping into account more attributes such as the options for thesis/capstone/scholarly-paper and choice of subjects based on open-elective courses provided for M-Tech CSE degree).

   The code is as given below:

```
/*Elective Advisory System for Mtech CSE Students*/

electiveadvisorysys :-
    expert_sys,
    reset_sys,
    choose_electives(Elective),
    choose_project(Project),
    choose_theory(Theory),
    choose_system(System),
    choose_software(Software),
    choose_openelec(Openelec),
    detail(Elective),
    describe_project(Project),
    describe_theory(Theory),
    describe_system(System),
    describe_software(Software),
    describe_openelec(Openelec),nl.

/*In case the advisory system is not able to find any right elective
courses for the student*/

electiveadvisorysys :-
    write('Looks like we could\'nt find the right electives for
you!'),nl,
    write('Want to give it another try? (Type electiveadvisorysys
followed by a dot to try again!)'),nl.

/*This takes care of the Welcome Message when the advisory system is
consulted and called*/

expert_sys :-
    write('Welcome to M-Tech CSE Elective Advisory System!'),nl,
    write('I\'ll help you find the best elective courses for your M-Tech
CSE Programme'),nl,
```

```
    write('For each question asked, enter your choice followed by a dot.
Let us begin!'),nl,nl.


/*These are the different components that will be tested for trueness in
order to display the result*/

choose_electives(Elective) :-
    elective(Elective),!.

choose_project(Project) :-
    project(Project),!.

choose_theory(Theory) :-
    theory(Theory),!.

choose_system(System) :-
    system(System),!.

choose_software(Software) :-
    software(Software),!.

choose_openelec(Openelec) :-
    openelec(Openelec),!.


/*These are the different core elective courses a student can take based
on their input options*/

elective(aibasic) :-
    field(ai),
    (
        (gparange(lowgpa),test_position(napos));
        (gparange(nagpa),test_position(bottompos))
    ).

elective(aimixed) :-
    field(ai),
    (
        (gparange(medgpa),test_position(napos));
        (gparange(nagpa),test_position(midpos))
    ).

elective(aiadvanced) :-
    field(ai),
    (
        (gparange(highgpa),test_position(napos));
        (gparange(nagpa),test_position(toppos))
    ).
```

```
elective(databasic) :-
    field(data),
    (
        (gparange(lowgpa),test_position(napos));
        (gparange(nagpa),test_position(bottompos))
    ).

elective(datamixed) :-
    field(data),
    (
        (gparange(medgpa),test_position(napos));
        (gparange(nagpa),test_position(midpos))
    ).

elective(dataadvanced) :-
    field(data),
    (
        (gparange(highgpa),test_position(napos));
        (gparange(nagpa),test_position(toppos))
    ).

elective(infosecbasic) :-
    field(inforsys),
    (
        (gparange(lowgpa),test_position(napos));
        (gparange(nagpa),test_position(bottompos))
    ).

elective(infosecmixed) :-
    field(inforsys),
    (
        (gparange(medgpa),test_position(napos));
        (gparange(nagpa),test_position(midpos))
    ).

elective(infosecadvanced) :-
    field(inforsys),
    (
        (gparange(highgpa),test_position(napos));
        (gparange(nagpa),test_position(toppos))
    ).

elective(mobcompmixed) :-
    field(mobcomp),
    (
        (
        (gparange(lowgpa);gparange(medgpa)),
         test_position(napos));
```

```
        (gparange(nagpa),
         (test_position(bottompos);test_position(midpos)))
    ).

elective(mobcompadv) :-
    field(mobcomp),
    (
        (gparange(highgpa),test_position(napos));
        (gparange(nagpa),test_position(toppos))
    ).

elective(netwmixed) :-
    field(netw),
    (
        (
        (gparange(lowgpa);gparange(medgpa)),
         test_position(napos));
        (gparange(nagpa),
         (test_position(bottompos);test_position(midpos)))
    ).

elective(netwadvanced) :-
    field(netw),
    (
        (gparange(highgpa),test_position(napos));
        (gparange(nagpa),test_position(toppos))
    ).

elective(sdevbasic) :-
    field(sdev),
    (
        (gparange(lowgpa),test_position(napos));
        (gparange(nagpa),test_position(bottompos))
    ).

elective(sdevadvanced) :-
    field(sdev),
    (
        (
        (gparange(medgpa);gparange(highgpa)),
         test_position(napos));
        (gparange(nagpa),
         (test_position(midpos);test_position(toppos)))
    ).

elective(gamedevcomm) :-
    field(gamedev),
    (
        (
```

```
        (gparange(lowgpa);gparange(medgpa);gparange(highgpa)),
         test_position(napos));
        (gparange(nagpa),

(test_position(bottompos);test_position(midpos);test_position(toppos)))
    ).

elective(webdevcomm) :-
    field(webdev),
    (
        (
        (gparange(lowgpa);gparange(medgpa);gparange(highgpa)),
         test_position(napos));
        (gparange(nagpa),

(test_position(bottompos);test_position(midpos);test_position(toppos)))
    ).


/*This is made in order to understand the number of credits of coursework
a student needs to complete if thesis/paper/project are being taken*/

project(optresearch) :-
    research_or_industry(research).

project(optindustry) :-
    research_or_industry(industry).

project(optscholarly) :-
    research_or_industry(docm).

project(optcourse) :-
    research_or_industry(coursework).


/*This is for the choice of course for the student from the theory
bucket*/

theory(alggrad) :-
    theory_bucket(gradalgo).

theory(madalg) :-
    theory_bucket(modernalgo).

theory(ralg) :-
    theory_bucket(randalgo).
```

```
/*This is for the choice of course for the student from the systems
bucket*/

system(archi) :-
    system_bucket(comparch).

system(mob) :-
    system_bucket(mobile).

system(wirnet) :-
    system_bucket(network).


/*This is for the choice of course for the student from the software
bucket*/

software(programaly) :-
    software_bucket(progaly).

software(retrinf) :-
    software_bucket(inforet).

software(compiprog) :-
    software_bucket(compiler).


/*This is for the list of open elective courses for the students based on
their preference*/

openelec(healthmed) :-
    type_industry(health).

openelec(designing) :-
    type_industry(design).

openelec(financial) :-
    type_industry(finance).

openelec(technosoc) :-
    type_industry(sociotech).

openelec(entrepreneural) :-
    type_industry(entrep).


/*The messages to be displayed for each elective result based on student
input*/

detail(aibasic) :-
```

```
  write('You can take up the basic AI courses. This includes:'),nl,
  write('Machine Learning - CSE543'),nl,
  write('Image Analysis - CSE540'),nl,
  write('Multi-Agent Systems - CSE531'),nl,
  write('Artificial Intelligence - CSE643'),nl,
  write('Reinforcement Learning - CSE564'),nl,
  write('Data Mining - CSE506'),nl,nl.

detail(aimixed) :-
  write('You can take up the slightly advanced AI courses. This
includes:'),nl,
  write('Machine Learning - CSE543'),nl,
  write('Image Analysis - CSE540'),nl,
  write('Deep Learning - CSE641'),nl,
  write('Artificial Intelligence - CSE643'),nl,
  write('Trustworthy AI systems - CSE660'),nl,
  write('Edge AI - CSE663'),nl,nl.

detail(aiadvanced) :-
  write('You can take up the highly advanced AI courses. This
includes:'),nl,
  write('Machine Learning - CSE543'),nl,
  write('Topics in Software Engineering: AI in SE - CSE701'),nl,
  write('Deep Learning - CSE641'),nl,
  write('Artificial Intelligence - CSE643'),nl,
  write('Trustworthy AI systems - CSE660'),nl,
  write('Edge AI - CSE663'),nl,nl.

detail(databasic) :-
  write('You can take up the basic Data Science and Analytics courses.
This includes:'),nl,
  write('Machine Learning - CSE543'),nl,
  write('Image Analysis - CSE540'),nl,
  write('Information Retrieval - CSE508'),nl,
  write('Big Data Analytics - CSE510A'),nl,
  write('Database system Implementation - CSE507'),nl,
  write('Data Mining - CSE506'),nl,nl.

detail(datamixed) :-
  write('You can take up the slightly advanced Data Science and Analytics
courses. This includes:'),nl,
  write('Machine Learning - CSE543'),nl,
  write('Collaborative Filtering - CSE640'),nl,
  write('Data warehousing - CSE606'),nl,
  write('Natural Language Processing - CSE556'),nl,
  write('GPU Computing - CSE560'),nl,
  write('Probabilistic Graphical Models - CSE561'),nl,nl.

detail(dataadvanced) :-
```

```
  write('You can take up the highly advanced Data Science and Analytics
courses. This includes:'),nl,
  write('Machine Learning - CSE543'),nl,
  write('Collaborative Filtering - CSE640'),nl,
  write('Data warehousing - CSE606'),nl,
  write('Mining Large Networks - CSE559'),nl,
  write('Semantic Web - CSE632'),nl,
  write('Probabilistic Graphical Models - CSE561'),nl,nl.

detail(infosecbasic) :-
  write('You can take up the basic Information Security courses. This
includes:'),nl,
  write('Secure Coding - CSE500'),nl,
  write('Theory of Modern Cryptography - CSE524'),nl,
  write('Foundations of Conputer Security - CSE545'),nl,
  write('Applied Cryptography - CSE546'),nl,
  write('Security Engineering - CSE552'),nl,
  write('Internet Security and Privacy - CSE5xx'),nl,nl.

detail(infosecmixed) :-
  write('You can take up the slightly advanced Information Security
courses. This includes:'),nl,
  write('Secure Coding - CSE500'),nl,
  write('Topics in Computer Security - CSE694A'),nl,
  write('Foundations of Conputer Security - CSE545'),nl,
  write('Applied Cryptography - CSE546'),nl,
  write('Privacy and Security in Online Social Media - CSE648'),nl,
  write('Digital and Cyber Forensics - CSE645'),nl,nl.

detail(infosecadvanced) :-
  write('You can take up the highly advanced Information Security
courses. This includes:'),nl,
  write('Network Security - CSE550'),nl,
  write('Topics in Computer Security - CSE694A'),nl,
  write('Foundations of Conputer Security - CSE545'),nl,
  write('Network Anonymity and Privacy - CSE749'),nl,
  write('Privacy and Security in Online Social Media - CSE648'),nl,
  write('Ethical Hacking - CSE798A'),nl,nl.

detail(mobcompmixed) :-
  write('You can take up these Mobile Computing courses which
include:'),nl,
  write('Network Security - CSE550'),nl,
  write('Distributed Systems Security - CSE530'),nl,
  write('Embedded Systems - CSE537'),nl,
  write('Cellular Data Networks - CSE539'),nl,
  write('Introduciton to Spatial Computing - CSE555'),nl,
  write('Mobile Computing - CSE535'),nl,nl.
```

```
detail(mobcompadv) :-
  write('You can take up these advanced Mobile Computing courses which
include:'),nl,
  write('Smart sensing for Internet of Things - CSE576'),nl,
  write('Advanced Topics in Mobile Computing - CSE734'),nl,
  write('Embedded Systems - CSE537'),nl,
  write('Programming Cloud Services for Mobile Applications - CE635'),nl,
  write('Mobile and Cellular Network Security - CSE647'),nl,
  write('Mobile Computing - CSE535'),nl,nl.

detail(netwmixed) :-
  write('One of the good options for General degree with no
specialization'),nl,
  write('You can take up these Networking based courses which
include:'),nl,
  write('Network Security - CSE550'),nl,
  write('Wireless Networks - CSE538'),nl,
  write('Communication Networks - CSE636'),nl,
  write('Cellular Data Networks - CSE539'),nl,
  write('Ad Hoc Wireless Networks - CSE5xx'),nl,
  write('Network Science - CSE655'),nl,nl.

detail(netwadvanced) :-
  write('One of the good options for General degree with no
specialization'),nl,
  write('You can take up these advanced Networking based courses which
include:'),nl,
  write('Networks and System Security II - CSE550'),nl,
  write('Wireless Networks - CSE538'),nl,
  write('Communication Networks - CSE636'),nl,
  write('Cellular Data Networks - CSE539'),nl,
  write('Network Anonymity and Privacy - CSE749'),nl,
  write('Network Science - CSE655'),nl,nl.

detail(sdevbasic) :-
  write('One of the good options for General degree with no
specialization'),nl,
  write('You can take up these sofware development based courses which
include:'),nl,
  write('Software defined networking - CSE565'),nl,
  write('Software Production Evolution and Maintenance - CSE582'),nl,
  write('Software Development using Open Source - CSE583'),nl,
  write('Foundations of Parallel Programming - CSE502'),nl,
  write('Program Verification - CSE584'),nl,nl.

detail(sdevadvanced) :-
  write('One of the good options for General degree with no
specialization'),nl,
```

```
  write('You can take up these sofware development based courses which
include:'),nl,
  write('Software defined networking - CSE565'),nl,
  write('Software Production Evolution and Maintenance - CSE582'),nl,
  write('Software Development using Open Source - CSE583'),nl,
  write('Topics in Software Engineering: AI in SE - CSE701'),nl,
  write('Program Verification - CSE584'),nl,nl.

detail(gamedevcomm) :-
  write('One of the good options for General degree with no
specialization and may also include open electives'),nl,
  write('You can take up these Game development and Graphic Designing
based courses which include:'),nl,
  write('Multi-Agent Systems - CSE531'),nl,
  write('Game Design and Development - DES512'),nl,
  write('Introduction to 3D Production Design for Animation and Games -
DES516'),nl,
  write('Introduction to Motion Graphics - DES518'),nl,
  write('Computer Graphics - CSE533'),nl,nl.

detail(webdevcomm) :-
  write('One of the good options for General degree with no
specialization'),nl,
  write('You can take up these Web development based courses which
include:'),nl,
  write('Semantic Web - CSE632'),nl,
  write('Network Science - CSE655'),nl,
  write('Students can take up online courses as Independent Study from
some Faculty such as:'),nl,
  write('Web Designing'),nl,
  write('Introduction to WordPress'),nl,
  write('Essentials of Responsive Web Designing'),nl,
  write('UI and Web Design Tutorial'),nl,nl.


/*The messages to be displayed for each project option based on student
input*/

describe_project(optresearch) :-
  write('You have a strong inclination towards full-fledged
research.'),nl,
  write('For this you need to complete atleast 32 credits of course work
for a 16 credit thesis.'),nl,nl.

describe_project(optindustry) :-
  write('You have a strong inclination towards opting for industry based
projects.'),nl,
  write('In this case there are two options:'),nl,
  write('A 4 credit capstone project with 44 credits of coursework'),nl,
```

```
  write('An 8 credit capstone project with 40 credits of coursework'),nl,
  write('If you have a specialization then try to take up the capstone
project based on your specialization, else you can also take one based on
the field of your interest'),nl,nl.

describe_project(optscholarly) :-
  write('You have a strong inclination towards analysing and
comprehending the work done behind the topic that interests you along
with impeccable desire for reporting and documentation.'),nl,
  write('In this case there are two options:'),nl,
  write('A 4 credit scholarly paper work with 44 credits of
coursework'),nl,
  write('An 8 credit scholarly paper work with 40 credits of
coursework'),nl,nl.

describe_project(optcourse) :-
  write('You have chosen the option of completing degree without
Thesis/Capstone/Scholarly Paper'),nl,
  write('In this case you have to complete a total of 48 credits of
coursework'),nl,nl.


/*The messages to be displayed for each bucket course (one from each of
the 3 buckets - theory, systems and software) based on student input*/

describe_theory(alggrad) :-
  write('For the theory bucket, \"Introduction to Graduate Algorithms -
CSE525\" is the right choice for you.'),nl,nl.

describe_theory(madlag) :-
  write('For the theory bucket, \"Modern Algorithm Design - CSE519\" is
the right choice for you.'),nl,nl.

describe_theory(ralg) :-
  write('For the theory bucket, \"Randomized Algorithms - CSE523\" is the
right choice for you.'),nl,nl.



describe_system(archi) :-
  write('For the systems bucket, \"Computer Architecture - CSE511\" is
the right choice for you.'),nl,nl.

describe_system(mob) :-
  write('For the systems bucket, \"Mobile Compting - CSE535\" is the
right choice for you.'),nl,nl.

describe_system(wirnet) :-
```

```
  write('For the systems bucket, \"Wireless Networks - CSE638\" is the
right choice for you.'),nl,nl.



describe_software(programaly) :-
  write('For the software bucket, \"Program Analysis - CSE503\" is the
right choice for you.'),nl,nl.

describe_software(retrinf) :-
  write('For the software bucket, \"Information Retrieval - CSE508\" is
the right choice for you.'),nl,nl.

describe_software(compiprog) :-
  write('For the software bucket, \"Compiler - CSE601\" is the right
choice for you.'),nl,nl.


/*The messages to be displayed for the open elective types based on
student input*/

describe_openelec(healthmed) :-
  write('You can take from the following open electives for your
interest:'),nl,
  write('Biomedical Image Processing - BIO524'),nl,
  write('Machine Learning for Biomedical Applications - CSE542'),nl,
  write('Computing for Medicine - CSE585'),nl,
  write('Computer Aided Drug Design - CSE561'),nl,nl.

describe_openelec(designing) :-
  write('You can take from the following open electives for your
interest:'),nl,
  write('Designing Human Centered Systems - CSE501'),nl,
  write('Game Design and Development - DES512'),nl,
  write('Design of Interactive Systems - DES519'),nl,
  write('Introduction to 3D Production Design for Animation and Games -
DES516'),nl,nl.

describe_openelec(financial) :-
  write('You can take from the following few open electives for your
interest:'),nl,
  write('The course ID at 200s/300s/400s can only be taken for 8 credits
/ two 4 credit courses'),nl,
  write('Foundations of Finance - ECO331'),nl,
  write('Macroeconomics - ECO201'),nl,
  write('Microeconomics - ECO301'),nl,
  write('Valuation and Portfolio Management - ECO332'),nl,nl.

describe_openelec(technosoc) :-
```

```
  write('You can take from the following few open electives for your
interest:'),nl,
  write('The course ID at 200s/300s/400s can only be taken for 8 credits
/ two 4 credit courses'),nl,
  write('Information Technology and Society - SOC207'),nl,
  write('Science, Technology and Society - SOC211'),nl,
  write('Technology and the Future of Work - SOC512'),nl,
  write('Philosophy of Technology - SSH3PT'),nl,nl.

describe_openelec(entrepreneural) :-
  write('You can take from the following few open electives for your
interest:'),nl,
  write('The course ID at 200s/300s/400s can only be taken for 8 credits
/ two 4 credit courses'),nl,
  write('Entrepreneurial Communication - ENT411'),nl,
  write('Entrepreneurial Khichadi - ENT412'),nl,
  write('Entrepreneurial Finance - ENT413'),nl,
  write('Healthcare Innovation and Entrepreneuriship Essentials -
ENT421'),nl,nl.


/*Call to built-in dynamic for the advisory system*/


:- dynamic(answered/2).

/*Retracts all the options chosen for each question and resets the
advisory system for a new set of inputs*/

reset_sys :-
    retractall(answered(_,_)).
reset_sys.


/*Different questions asked to the student to give them advice on the
electives one can choose*/

question(field) :-
    write('In which computer science field are you interested in ?'),nl.

question(gparange) :-
    write('In which range does your GPA fall under ? (Select \'Not
Applicable\' if you have not completed atleast one semester in this
degree)'),nl.

question(test_position) :-
    write('What was the position that you acquired in your MTech
Admission test result ? (Select \'Not Applicable\' if you have completed
atleast one semester in this degree)'),nl.
```

```
question(research_or_industry) :-
    write('Please select your preference in terms of research or
industry'),nl.

question(theory_bucket) :-
    write('In terms of Algorithm design, choose your preference from the
following options:'),nl.

question(system_bucket) :-
    write('Which system do you want to work with ?'),nl.

question(software_bucket) :-
    write('Which type of software knowledge do you want to gain ?'),nl.

question(type_industry) :-
    write('Which type of type of industry would you like to learn and
perhaps work in the future ?'),nl.

/*Option for Question 1*/

option(ai) :- write('Artificial Intelligence - AI').
option(data) :- write('Data Science and Analytics').
option(inforsys) :- write('Information Security').
option(mobcomp) :- write('Mobile Computing').
option(netw) :- write('Networking').
option(sdev) :- write('Software Development and Testing').
option(gamedev) :- write('Game Development and Graphic Designing').
option(webdev) :- write('Web Development').

/*Option for Question 2*/

option(lowgpa) :- write('6 to 8 cgpa').
option(medgpa) :- write('8 to 9 cgpa').
option(highgpa) :- write('9 to 10 cgpa').
option(nagpa) :- write('Not Applicable').

/*Option for Question 3*/

option(toppos) :- write('1st to 20th position in admission result').
option(midpos) :- write('21st to 60th position in admission result').
option(bottompos) :- write('61st to 100th position in admission result').
option(napos) :- write('Not Applicable').

/*Option for Question 4*/

option(research) :- write('I want to into research and perhaps do a
PhD').
```

```
option(industry) :- write('I want to acquire skills and gain experience
throigh projects for industry based career').
option(docm) :- write('I like learning about different technologies and
the work that goes behind it and love to write a paper on it, like some
documentation instead of a full-fledged project').
option(coursework) :- write('I would rather like to do all course-work to
gain my mtech degree').

/*Option for Question 5*/

option(gradalgo) :- write('After learning Data Structures and Algorithms,
I want to learn advanced form of algorithmic concepts that will help me
design better optimised algorithm solutions for my interviews and future
job').
option(modernalgo) :- write('After DSA, I want to now learn and
understand algorithms that solve problems of various disciplines by
utilising modern tools').
option(randalgo) :- write('I want to learn algorithms that deal with
probabilistic events, by analysing a given input distribution and hence
be able to design algorithms with provable bounds').

/*Option for Question 6*/

option(comparch) :- write('I want to learn about the architecture of
computer systems and how the programs run internally in computer
systems').
option(mobile) :- write('I want to learn a new skill that is relevant for
the tech industry and requires the knowledge of android programming and
mobile functionalities, features, internal architecture, security and
permissions').
option(network) :- write('Related to the field of networking, I want to
delve deeper into the concept of wireless networks and understand their
architecture and application').

/*Option for Question 7*/

option(progaly) :- write('I like to analyse and understand programs which
is an advancement of DSA and Advanced Programming courses and implement
dataflow analysis and flow-sensitive inter-procedural analysis').
option(inforet) :- write('I like to dive deep into the methods by which
we can retrieve information using different algorithms and hence
utilising the resultant retrieved data or information for making
data-driven decisions and providing accurate services').
option(compiler) :- write('I like to learn how a normal program in any
language is compiled by machines to be able to compute and give ouput or
result in some machine action by being able to parse the different
elements in a program for the correct computation using grammar and hence
be able to build programming languages through compiler knowledge').
```

```
/*Option for Question 8*/

option(health) :- write('Healthcare Industry').
option(design) :- write('Design Industry').
option(finance) :- write('Finance based Industry').
option(sociotech) :- write('Technology for Social Cause').
option(entrep) :- write('Entrepreneurship').


/*Combining the questions with their corresponding questions*/

field(Answer) :-
    answered(field,Answer),!.
field(Answer) :-
    \+ answered(field,_),
    ask(field, Answer,
[ai,data,inforsys,mobcomp,netw,sdev,gamedev,webdev]).

gparange(Answer) :-
    answered(gparange,Answer),!.
gparange(Answer) :-
    \+ answered(gparange,_),
    ask(gparange, Answer, [lowgpa,medgpa,highgpa,nagpa]).

test_position(Answer) :-
    answered(test_position,Answer),!.
test_position(Answer) :-
    \+ answered(test_position,_),
    ask(test_position, Answer, [toppos,midpos,bottompos,napos]).

research_or_industry(Answer) :-
    answered(research_or_industry,Answer),!.
research_or_industry(Answer) :-
    \+ answered(research_or_industry,_),
    ask(research_or_industry, Answer,
[research,industry,docm,coursework]).

theory_bucket(Answer) :-
    answered(theory_bucket,Answer),!.
theory_bucket(Answer) :-
    \+ answered(theory_bucket,_),
    ask(theory_bucket, Answer, [gradalgo,modernalgo,randalgo]).

system_bucket(Answer) :-
    answered(system_bucket,Answer),!.
system_bucket(Answer) :-
    \+ answered(system_bucket,_),
    ask(system_bucket, Answer, [comparch,mobile,network]).
```

```
software_bucket(Answer) :-
    answered(software_bucket,Answer),!.
software_bucket(Answer) :-
    \+ answered(software_bucket,_),
    ask(software_bucket, Answer, [progaly,inforet,compiler]).

type_industry(Answer) :-
    answered(type_industry,Answer),!.
type_industry(Answer) :-
    \+ answered(type_industry,_),
    ask(type_industry, Answer, [health,design,finance,sociotech,entrep]).


/*Ask function in order to retrieve the options opted/selected by user
for each question*/

ask(Question, Answer, Options) :-
      question(Question),
      generate_options(Options, 1),
      read(Index),
      find_option(Index, Options, Selection),
      asserta(answered(Question, Selection)),
      Selection = Answer.


/*Find Option utility element to find the correct option selected by the
user/student*/

find_option(1, [Head|_] , Head).
find_option(Index, [_|Tail], Result) :-
      Nextindex is Index -1,
      find_option(Nextindex, Tail, Result).


/*Generating options for each question for the advisory system*/

generate_options([],_).
generate_options([Head|Tail], Index) :-
      write(Index), write(' '),
      option(Head), nl,
      Nextindex is Index +1,
      generate_options(Tail, Nextindex).
```

2. Screenshots for the advisory system:

(a)

```
?-
% c:/Users/dedri/OneDrive/Documents/Prolog/electiveadvisorysys.pl compiled 0.00 sec, 144 clauses
?- electiveadvisorysys.
Welcome to M-Tech CSE Elective Advisory System!
I'll help you find the best elective courses for your M-Tech CSE Programme
For each question asked, enter your choice followed by a dot. Let us begin!

In which computer science field are you interested in ?
1 Artificial Intelligence - AI
2 Data Science and Analytics
3 Information Security
4 Mobile Computing
5 Networking
6 Software Development and Testing
7 Game Development and Graphic Designing
8 Web Development
|: 5.
In which range does your GPA fall under ? (Select 'Not Applicable' if you have not completed atleast one semeste
r in this degree)
1 6 to 8 cgpa
2 8 to 9 cgpa
3 9 to 10 cgpa
4 Not Applicable
|: 2.
What was the position that you acquired in your MTech Admission test result ? (Select 'Not Applicable' if you ha
ve completed atleast one semester in this degree)
1 1st to 20th position in admission result
2 21st to 60th position in admission result
3 61st to 100th position in admission result
4 Not Applicable
|: 4.
Please select your preference in terms of research or industry
1 I want to into research and perhaps do a PhD
2 I want to acquire skills and gain experience throigh projects for industry based career
3 I like learning about different technologies and the work that goes behind it and love to write a paper on it,
 like some documentation instead of a full-fledged project
4 I would rather like to do all course-work to gain my mtech degree
|: 4.

In terms of Algorithm design, choose your preference from the following options:
1 After learning Data Structures and Algorithms, I want to learn advanced form of algorithmic concepts that will
 help me design better optimised algorithm solutions for my interviews and future job
2 After DSA, I want to now learn and understand algorithms that solve problems of various disciplines by utilisi
ng modern tools
3 I want to learn algorithms that deal with probabilistic events, by analysing a given input distribution and he
nce be able to design algorithms with provable bounds
|: 1.
Which system do you want to work with ?
1 I want to learn about the architecture of computer systems and how the programs run internally in computer sys
tems
2 I want to learn a new skill that is relevant for the tech industry and requires the knowledge of android progr
amming and mobile functionalities, features, internal architecture, security and permissions
3 Related to the field of networking, I want to delve deeper into the concept of wireless networks and understan
d their architecture and application
|: 3.
Which type of software knowledge do you want to gain ?
1 I like to analyse and understand programs which is an advancement of DSA and Advanced Programming courses and
implement dataflow analysis and flow-sensitive inter-procedural analysis
2 I like to dive deep into the methods by which we can retrieve information using different algorithms and hence
 utilising the resultant retrieved data or information for making data-driven decisions and providing accurate s
ervices
3 I like to learn how a normal program in any language is compiled by machines to be able to compute and give ou
put or result in some machine action by being able to parse the different elements in a program for the correct
computation using grammar and hence be able to build programming languages through compiler knowledge
|: 2.
Which type of type of industry would you like to learn and perhaps work in the future ?
1 Healthcare Industry
2 Design Industry
3 Finance based Industry
4 Technology for Social Cause
5 Entrepreneurship
|: 2.
```

Output:

```
One of the good options for General degree with no specialization
You can take up these Networking based courses which include:
Network Security - CSE550
Wireless Networks - CSE538
Communication Networks - CSE636
Cellular Data Networks - CSE539
Ad Hoc Wireless Networks - CSE5xx
Network Science - CSE655

You have chosen the option of completing degree without Thesis/Capstone/Scholarly Paper
In this case you have to complete a total of 48 credits of coursework

For the theory bucket, "Introduction to Graduate Algorithms - CSE525" is the right choice for you.

For the systems bucket, "Wireless Networks - CSE638" is the right choice for you.

For the software bucket, "Information Retrieval - CSE508" is the right choice for you.

You can take from the following open electives for your interest:
Designing Human Centered Systems - CSE501
Game Design and Development - DES512
Design of Interactive Systems - DES519
Introduction to 3D Production Design for Animation and Games - DES516


true .
```

(b)

```
?- electiveadvisorysys.
Welcome to M-Tech CSE Elective Advisory System!
I'll help you find the best elective courses for your M-Tech CSE Programme
For each question asked, enter your choice followed by a dot. Let us begin!

In which computer science field are you interested in ?
1 Artificial Intelligence - AI
2 Data Science and Analytics
3 Information Security
4 Mobile Computing
5 Networking
6 Software Development and Testing
7 Game Development and Graphic Designing
8 Web Development
|: 1.
In which range does your GPA fall under ? (Select 'Not Applicable' if you have not completed atleast one semeste
r in this degree)
1 6 to 8 cgpa
2 8 to 9 cgpa
3 9 to 10 cgpa
4 Not Applicable
|: 3.
What was the position that you acquired in your MTech Admission test result ? (Select 'Not Applicable' if you ha
ve completed atleast one semester in this degree)
1 1st to 20th position in admission result
2 21st to 60th position in admission result
3 61st to 100th position in admission result
4 Not Applicable
|: 4.
Please select your preference in terms of research or industry
1 I want to into research and perhaps do a PhD
2 I want to acquire skills and gain experience throigh projects for industry based career
3 I like learning about different technologies and the work that goes behind it and love to write a paper on it,
 like some documentation instead of a full-fledged project
4 I would rather like to do all course-work to gain my mtech degree
|: 3.

In terms of Algorithm design, choose your preference from the following options:
1 After learning Data Structures and Algorithms, I want to learn advanced form of algorithmic concepts that will
 help me design better optimised algorithm solutions for my interviews and future job
2 After DSA, I want to now learn and understand algorithms that solve problems of various disciplines by utilisi
ng modern tools
3 I want to learn algorithms that deal with probabilistic events, by analysing a given input distribution and he
nce be able to design algorithms with provable bounds
|: 1.
Which system do you want to work with ?
1 I want to learn about the architecture of computer systems and how the programs run internally in computer sys
tems
2 I want to learn a new skill that is relevant for the tech industry and requires the knowledge of android progr
amming and mobile functionalities, features, internal architecture, security and permissions
3 Related to the field of networking, I want to delve deeper into the concept of wireless networks and understan
d their architecture and application
|: 1.
Which type of software knowledge do you want to gain ?
1 I like to analyse and understand programs which is an advancement of DSA and Advanced Programming courses and
implement dataflow analysis and flow-sensitive inter-procedural analysis
2 I like to dive deep into the methods by which we can retrieve information using different algorithms and hence
 utilising the resultant retrieved data or information for making data-driven decisions and providing accurate s
ervices
3 I like to learn how a normal program in any language is compiled by machines to be able to compute and give ou
put or result in some machine action by being able to parse the different elements in a program for the correct
computation using grammar and hence be able to build programming languages through compiler knowledge
|: 1.
Which type of type of industry would you like to learn and perhaps work in the future ?
1 Healthcare Industry
2 Design Industry
3 Finance based Industry
4 Technology for Social Cause
5 Entrepreneurship
|: 4.
```

Output:

```
You can take up the highly advanced AI courses. This includes:
Machine Learning - CSE543
Topics in Software Engineering: AI in SE - CSE701
Deep Learning - CSE641
Artificial Intelligence - CSE643
Trustworthy AI systems - CSE660
Edge AI - CSE663

You have a strong inclination towards analysing and comprehending the work done behind the topic that interests
you along with impeccable desire for reporting and documentation.
In this case there are two options:
A 4 credit scholarly paper work with 44 credits of coursework
An 8 credit scholarly paper work with 40 credits of coursework

For the theory bucket, "Introduction to Graduate Algorithms - CSE525" is the right choice for you.

For the systems bucket, "Computer Architecture - CSE511" is the right choice for you.

For the software bucket, "Program Analysis - CSE503" is the right choice for you.

You can take from the following few open electives for your interest:
The course ID at 200s/300s/400s can only be taken for 8 credits / two 4 credit courses
Information Technology and Society - SOC207
Science, Technology and Society - SOC211
Technology and the Future of Work - SOC512
Philosophy of Technology - SSH3PT


true .
```